

**DEVELOPMENT OF A PORTABLE
COMMUNICATOR/TRANSLATOR PROTOTYPE**



FOR:

**Transportation Development Centre
Policy and Coordination Group
Transport Canada**

BY:

**RUTENBERG DESIGN INC.
in Association with
Centre for Speech Technology Research
Ergo Systems Canada Inc.**

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Un sommaire français de ce rapport est inclus avant la table des matières.



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16. Abstract This report describes the development and ergonomic evaluation of a portable communicator/translator for use at check-in counters in transportation terminals by hearing, speech and language impaired travellers. The unit consists of a counter-top device with a central component housing the computer and two touch screens on opposite sides. Each screen pivots into its respective working position, one on the agent's side and one on the passenger's side. The unit receives its power from a standard 115 V outlet. The passenger may choose between English, French, Spanish and Chinese; the agent may choose between English and French. The passenger's language is translated directly into the agent's language and vice versa. Dialogue regarding ticket, flight, baggage, seating and personal identification, is carried on through a largely menu-driven system. The design of system logic, text, and display formats was based on the need to maximize rate of information exchange, while adhering to principles of communication and ensuring user friendly operation of the system. The ergonomic evaluation consisted of comprehensive field tests at Vancouver International Airport. Results indicate that with some refinements to the existing prototype, the system will facilitate communication for the disabled traveller, and increase the agent's efficiency during check-in.					
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16. Résumé Ce rapport décrit la réalisation et l'évaluation ergonomique d'un appareil de communication/traduction devant être placé aux guichets d'enregistrement dans les aéroports à l'intention des voyageurs handicapés par un trouble de l'ouïe ou de la parole, ou par une barrière linguistique. Il s'agit d'un appareil portatif comportant une unité centrale dans laquelle est logée l'ordinateur, et deux écrans tactiles pivotants placés dos à dos, l'un destiné au préposé de la compagnie aérienne et l'autre aux voyageurs. L'appareil se branche sur une prise de courant de 115 V. L'utilisateur a le choix de communiquer en français, en anglais, en espagnol ou en chinois; le préposé choisira le français ou l'anglais. Les messages de l'utilisateur sont traduits directement dans la langue choisie par le préposé et vice versa. Les dialogues concernant la vérification des billets et de l'identité du porteur, les horaires d'arrivée et de départ, l'enregistrement des bagages et l'assignation de places à bord se font dans une large mesure à l'aide de menus. Les logiciels, le texte et les panneaux d'affichage ont été étudiés avec le souci de rendre aussi rapide que possible l'échange d'information, tout en respectant les principes d'une bonne communication et en visant à rendre conviviale l'utilisation de l'appareil. L'évaluation ergonomique en service expérimental a été effectuée à l'aéroport international de Vancouver. Il semble que, moyennant quelques améliorations, le modèle essayé soit apte à faciliter la communication avec les voyageurs handicapés et à améliorer l'efficacité des formalités d'enregistrement					
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SUMMARY

The ability to communicate in person with a check-in agent is essential for travellers with hearing, speaking and language impairments.

The concept for a dialogue device grew out of the Mark I version of Communicaid, an information/communication system designed by Rutenberg Design Inc. in 1986 and developed by the Transportation Development Centre for use at transportation terminals. Rutenberg V., Communicaid: Development of an Integrated Communication System for the Sensory and Speech Impaired in Transportation Terminals, (TP 8806 E). Translaid, which stands for "Translation Aid", took on a conceptual character on its own when operational requirements in terminals dictated a need for a separate and independent information centre and a counter-top communication/dialogue device.

Rutenberg Design Inc. came up with a concept for a compact device to be placed at check-in counters, where it would be readily available to both agents and passengers.

The unit consists of a central component, which houses the power supply, disk drive and circuit boards, and two pivoting touch screens on opposite sides, one for the agent and one for the passenger. The unit is powered by a standard 115 V outlet. In its stored position on the check-in counter, and when not in use, a display panel faces the passenger side, indicating in English, French, Spanish and Chinese to press a key if dialogue assistance is required.

During development, special emphasis was put on the ergonomics of the physical interface and the information processing aspects. Dialogue regarding tickets, personal identification, flight schedules, baggage and seating is carried out through a largely menu-driven system. Input and response on each side is achieved through the use of flat electroluminescent touch screens.

The design of system logic, text and display formats was based on the need to maximize the rate of information exchange while adhering to principles of communication, avoiding the violation of human limitations in detecting, discriminating, and interpreting displays, as well as ensuring user-friendly operation of the system. The passenger's language is translated directly into the agent's, and vice versa.

One prototype was built as a proof of concept and an ergonomic field evaluation was carried out with several airline agents and disabled subjects acting as passengers. The outcome of this evaluation revealed that both passengers and agents felt that this device could contribute significantly as a communication tool for the disabled passenger, and thus enhance the airlines' efficiency in helping travellers with hearing, speech and language impairments.

Passengers and agents liked the lay-out of the screens and suggested necessary improvements in the following areas:

On the passenger's side:

- Revised translation for Spanish and Chinese;
- Increased screen sensitivity in touch areas;
- The hearing impaired need visual feedback for messages "received" and "sent".

On the agent's side:

- Messages must emphasize a higher level of customer service;
- The system should be as compatible as possible with present reservation systems used by airlines.

It is recommended that further tests be carried out by carriers for a longer period, with an improved pre-production model, in order to evaluate in-depth feedback regarding performance and operation, and to determine supply requirements for implementation in transportation terminals.

SOMMAIRE

Il est très important pour les voyageurs handicapés par un trouble de l'ouïe ou de la parole, ou par une barrière linguistique, de pouvoir communiquer en personne avec un préposé à l'enregistrement.

Le concept d'un appareil de dialogue a pris naissance avec le modèle Mark I du système intégré de communication Communicaid, étudié par la société Rutenberg Design Inc. en 1986, et réalisé par le Centre de développement des transports en vue de l'exploitation dans les installations terminales de transport (Rutenberg V., Communicaid: Development of an Integrated Communication System for the Sensory and Speech Impaired in Transportation Terminals, TP 8806E). Ce concept, qui devait donner lieu à l'appareil Translaid (pour "Translation Aid", c'est-à-dire aide à la traduction), a été mis à l'étude lorsqu'il est apparu nécessaire de doter les installations terminales d'un centre d'information et d'un système de communication séparés et indépendants.

La Rutenberg Design Inc. a étudié un appareil compact devant être placé aux guichets d'enregistrement, de sorte qu'il soit facilement accessible aux préposés comme aux voyageurs.

Cet appareil comprend une unité centrale logeant le bloc d'alimentation, le lecteur de disque et les plaquettes de circuits, et deux écrans tactiles opposés et pivotants, l'un destiné au préposé et l'autre aux voyageurs. Il est alimenté en 115 V. Lorsque l'appareil est rangé sur le comptoir, ou qu'il n'est pas utilisé, un message en français, en anglais, en espagnol et en chinois est affiché côté public pour signaler qu'il faut appuyer sur une touche pour demander une aide à la communication.

Une attention particulière a été portée à l'aspect ergonomique de l'interface et au mode de traitement de l'information. Le dialogue concernant la vérification des billets et de l'identité du porteur, les horaires d'arrivée et de départ, l'enregistrement des bagages et l'assignation de places à bord se fait dans une large mesure à l'aide de menus. La communication de part et d'autre du guichet se fait par l'intermédiaire d'écrans tactiles électroluminescents plats.

Les logiciels, le texte et les formats d'affichage ont été étudiés avec le souci de rendre aussi rapide que possible l'échange d'informations, tout en respectant les principes d'une bonne communication et les limites humaines quant à la perception, la discrimination et l'interprétation des messages et en visant à rendre l'utilisation conviviale. Les messages de l'utilisateur sont traduits directement dans la langue du préposé et vice versa.

Un modèle expérimental a été réalisé puis soumis à une évaluation ergonomique en service avec le concours de plusieurs agents de compagnies aériennes et de sujets handicapés jouant le rôle de passagers. Les deux groupes ont jugé que l'appareil facilitait les communications avec les passagers handicapés par un trouble de l'ouïe ou de la parole ou par une barrière linguistique, et ils étaient d'avis qu'il pourrait améliorer les services fournis à cette catégorie d'utilisateurs.

Les agents des compagnies aériennes comme les premiers intéressés ont apprécié le dispositif d'affichage, mais ont néanmoins suggéré quelques améliorations jugées nécessaires.

Côté utilisateur :

- révision des traductions pour l'espagnol et le chinois;
- augmentation de la sensibilité tactile des écrans;
- signaux visuels à l'intention des handicapés auditifs pour indiquer ou confirmer qu'un message est envoyé ou reçu.

Côté préposé :

- les messages devraient refléter un niveau plus élevé de service à la clientèle;
- le système devrait être le plus compatible possible avec les modalités de réservation adoptées par les compagnies aériennes.

Il est recommandé que le modèle essayé soit perfectionné puis remis en service expérimental auprès des compagnies aériennes pour une période prolongée afin d'obtenir une rétroaction aussi large que possible sur l'utilisation et le rendement de l'appareil et de déterminer la demande pour cet appareil dans les aéroports.



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1 INTRODUCTION

1.1 Background

At the present time, hearing and speech impaired travellers can be frustrated by their inability to communicate in transportation terminals, especially at check-in counters, customs and immigration, and security points, as well as in waiting lounges. The same is true for travellers who do not speak or read English or French.

There are several ways to overcome these communication difficulties: one is being accompanied by a travel companion or relative who can hear, speak and read; another is having a translator or sign language interpreter on call; and a third is to apply advanced technology combined with a human factors design approach.

The concept for Translaaid grew out of the Mark I version of Communicaid, an information/communication system designed in 1986 by Rutenberg Design Inc. for the Transportation Development Centre to use at transportation terminals. Rutenberg, V., Communicaid: Development of an Integrated Communication System for the Sensory and Speech Impaired in Transportation Terminals, (TP 8806 E).

Communicaid was originally designed to provide both information and dialogue: information on terminal facilities and dialogue between an operator/attendant and travellers with sensory or speech impairments.

Operational requirements of terminals dictated that Communicaid function independently without the presence of an attendant. It was then decided that the information should be separated from the dialogue mode, and this led to the creation of Translaaid as a dialogue device.

2 OBJECTIVES

The general objective was to eliminate travel barriers for the disabled and the elderly in all modes, and to develop alternative designs or procedures which make travel easier.

The specific objective of this project was to develop and build a portable unit to facilitate communication between speech, hearing and language impaired travellers and a carrier agent at the check-in counter.

3 REQUIREMENTS

3.1 Passengers

The potential target group for this project was characterized as follows:

- a) Hearing impaired travellers who can read English or French and might be able to speak both languages, but can not hear regular voice levels.
- b) Speech impaired travellers who can hear and read English or French, but cannot speak loudly or clearly enough to carry out a dialogue at a check-in counter.
- c) Travellers who can read their own language (e.g. Spanish, Chinese), but cannot understand or read English or French.

a) Hearing impaired

In this group, the following levels of hearing impairment can be found:

- 1. Total deafness
- 2. Perception of sound, but indistinguishable
- 3. Hearing with one ear only
- 4. Reduced hearing in both ears.

For the totally deaf, the problem is not only the lack of perceiving audio signals, but also the lack of audio stimuli that compose daily life situations. Very often, underdeveloped speech is combined with this impairment, due to the lack of feedback and the inability to control it.

Deaf people rely heavily on their vision to perceive information, e.g. sign language, lip reading, written text and symbols. Some hearing impaired perceive noise and can make a distinction between loud and low intensity but cannot distinguish words. For people with reduced hearing in one or both ears, an increase in volume intensity can sometimes help, e.g. use of amplifying earpieces, volume controlled phones etc. When the hearing reduction or loss is in one ear, the result is not only lack of perception on that side but lack of three-dimensional location of the sound source.

Requirements

For the hearing impaired to access information, the following aspects have to be considered:

- initiation of dialogue in a dignified manner, without having to point to ears or mouth;
- clear visual information of all audio conversation which takes place at the check-in counter (flight schedules, ticket issues, baggage, location of gates etc.);
- unobstructed view of dialogue partner and controlled light level to see partner and visual information;
- hard copy of information for critical issues, e.g. receipts, baggage tags, etc.;
- reflection and glarefree display of messages;
- use of fast and logical input devices for message exchange;
- ergonomically designed visual displays, e.g. letter style, size, color, punctuation etc.;
- ergonomically designed screen lay-out for effective and logical information processing, e.g. number of choices, position of receiving and sending messages, wording, linguistic characteristics, etc.

b) Speech impaired

Speech impairment is usually related to other impairments, for example, with individuals in wheelchairs, as injury to their nervous systems and, with the deaf, lack of audio feedback. Stuttering, another impairment, requires a slower pace of communication.

Requirements

Considering the specific dialogue situation at a check-in counter in a noisy terminal environment, the following is required:

- initiation of dialogue without pointing to mouth or ear;
- unobstructed view of dialogue partner;
- controlled light level to observe dialogue partner and/or display;
- ergonomically designed visual display;
- ergonomically designed screen lay-out;

Although a speech impaired individual might be able to hear the dialogue partner's message and only return his/her own answer in visual form, the noisy terminal environment might make it necessary for both partners to exchange visual messages only.

c) Language impaired

The speakers of certain languages with a totally different base, such as Chinese, Japanese and Slavic languages, are unable to find any visual or audio similarities, unlike Spanish and Italian speaking travellers who can read some French words because their languages share a common Latin background.

Requirements

To transcend language barriers, the following requirements were established:

- for initiation of dialogue, the traveller's language must be visible to him/her with an indication of how to proceed;
- messages must be displayed with the characteristics of their own culture;
- input devices must be familiar and be recognizable by many cultures;
- choice of technologies must keep in mind different cultural backgrounds.

3.1.1 Terminal and counter environment

The hectic, crowded and noisy terminal environment combined with jet lag and unfamiliar surroundings can influence the physical and mental alertness of any passenger. The result is often a reduction in physical stamina and in the capability for processing information, memorizing and concentrating.

These factors can be compounded for travellers with hearing, speech or language problems, when they are unable to communicate messages necessary to make specific travel arrangements. Crucial situations for such dialogue are found at check-in counters, customs and immigration, and security points, as well as in waiting lounges.

This project addresses the specific requirements at the carrier check-in counter. An earlier study conducted by the Transportation Development Centre (Rutenberg, U., Rutenberg A.M. Human Factors Approach to Technology for the Communication-impaired Traveller, TP 5113E, 1983) pointed out that the existing communication boards were not suitable for terminal check-in purposes. Observed ergonomic difficulties with these devices appeared to be related primarily to the following facts:

- the words and phrases stored in the memories are not specific to the type of dialogue that occurs between a passenger and a check-in agent;
- the exchange of messages is exceedingly slow and laborious;
- the boards themselves are one-sided which compounds the speed problem as it prevents immediate visual processing of messages and requires that the board be passed back and forth between conversing partners.

3.1.2 Dialogue

At the present time, some airlines are using typed pages written in various languages, and the traveller is asked to point to one question. The agent looks up this question in his/her language and points to an answer. This procedure not only frustrates both the passenger and the agent, but does not produce an effective exchange of information. Ideally, the dialogue should be as efficient and as courteous as anyone would have while speaking and listening to an agent. The passenger should leave the counter completely satisfied, with all transactions confirmed and any uncertainties clarified.

Typical problems as indicated by airlines are:

- a hearing or speech impaired passenger travelling alone and wanting to make changes to the present travel plan, e.g. having missed a flight, having a delayed flight, wanting to purchase a ticket or presenting him/herself too early for check-in.
- a passenger speaking a foreign language presents foreign documents, a prepaid ticket and has to change planes or modes, or requires a new boarding pass or accommodations due to a cancelled flight.

To address these problems, the passenger expects answers and wants to make decisions in the following categories:

- Ticket: validity, change of date, destination, class and price;
- Baggage: check-in baggage, carry-on baggage, special baggage;
- Seating location in front, midsection or rear; near window, centre, aisle; near washroom, bulkhead, etc.;
- Boarding pass: confirmation, seat, gate and time, flight number.

3.1.3 Operation

The passenger faces the agent at the check-in counter from a standing position with a counter 1.06-1.24 m (42-49") high separating both. The horizontal distance between the two persons is approximately 0.6-0.9 m (2-3'), with the agent usually working from a slightly elevated position. The countertop is 22-25 cm (8-10") wide and is used for exchanging documents such as passports, tickets, boarding passes, credit cards, etc. The passenger is able to use one or both hands within a 0.99-1.32 m (39-52") area of vertical height in front of the counter and a horizontal range of 60 cm (24"). The field of vision falls within the same area at an eye distance of 50-66 cm (20-26") from the source to be read. Any display device must be accessed within this range but must be brought to this location by someone other than the passenger.

The first task must be to make a passenger approaching the counter aware that help in carrying out a dialogue in his/her language or mode exists at this counter. Initiating the dialogue in a dignified way is the next step. Because of the characteristics of the target group, the exchange of messages can only be considered through the use of visual displays. Once the dialogue and all transactions have been completed, the visual displays must be moved aside to clear the countertop to serve the next passenger.

3.1.4 Availability

Because a passenger can line up at any counter, each counter should ideally have the facilities to carry out a dialogue using such a device. However, cost and demand will determine whether or not this is feasible. An alternative would be to equip a limited number of counters and design a mobile device which could be used upon request by another agent. In this case, a different initiation and information method must be found.

3.1.5 Acceptance of technology

The general tendency today shows an increase in the use of computer technology in the daily life of most people, e.g. television, video machines, banking machines, personal computers, toys, etc. It can therefore be assumed that the majority of the population is somewhat familiar with controls, screens, touch screens, displays, menus, cursors and the like. Except for the generation over 70 years old and people with a different technical or cultural background, this technology has been accepted and is used. Among the disabled population, the use of computer technology has increased significantly since it is often the only way to solve a problem, e.g. text to speech conversions for the blind, telecommunications devices (TDD's) for the hearing and speech impaired, and electronic steering for wheelchair users.

3.2 Agents

3.2.1 Agent characteristics and working environment

The agent, male or female, works at the check-in counter mostly from an elevated standing or sitting position and speaks French and English. Within this work space there is a monitor with a keyboard for access to flight and reservation data, storage for baggage tags, a surface to write on, sometimes a telephone and a tape dispenser. Below the work surface, typically within 1.65 m (5'), radius, there is a boarding pass printer, a baggage scale and a conveyor belt. The counter where the exchange of documents takes place is usually 1.06-1.25 m (42-49") high and 20-25 cm (8-10") wide at the top. The counter also serves as a barrier between the carrier's and the passenger's territory.

3.2.2 Dialogue

When the passenger arrives at the check-in counter, the agent usually initiates the dialogue with a greeting, e.g. "Hello", "Good morning", etc.

In the case of a hearing, speech or language impaired passenger, the agent cannot identify the impairment since it is not "visible". Therefore, the passenger takes the initiative by pointing to the mouth or ear, by using paper and pencil, or by showing a passport to indicate the language.

Since the agent is accustomed to working daily with computer technology and feels at ease in his/her environment, the dialogue design should put emphasis on the fact that the agent can handle a greater memory load, concentration and alertness than the passenger can. Typical scenarios include:

- ticket and flight arrangements;
- personal identification;
- seating choices;
- check-in and carry-on baggage;
- boarding pass(es).

An important ergonomic property must be that various modes can be run off in their customary order, but at the same time, the agent must be able to skip any of the mentioned check-in scenarios. Moreover, it must allow the agent to search for additional information, to switch to an alternate language or to initiate the flow of procedures. Furthermore, it must be possible for both the agent and the passenger to cancel and to correct selections made in error. The agent must be aware at all times of which message is given to the passenger's side.

3.2.3 Operation

In order to address the requirements of a hearing, speech or language impaired traveller, and in order for the agent not to be interrupted in the check-in routine, any technical device developed must satisfy the following conditions:

- allows the passenger to send a signal to the agent that help is required;
- does not interfere with eye contact space between the agent and passenger;
- can be operated from the agent's seated or standing position;
- located where it does not interfere with the agent's access to the monitor, keyboard, baggage tags or writing surface;
- positioned so an ergonomic operation can be performed
- controls and logic designed to be compatible with present reservation system logic;
- available at each counter, or is mobile so it can be transferred to another counter upon request.

3.2.4 Availability

A dialogue device must be made available at all counters, either through permanent installation or by being light, compact and mobile. When not in use, it should be within easy reach and direct visual and audible distance in order for the agent to detect a passenger's request.

3.3 Display design

In designing displays, it is necessary to conform to the principles of communication regarding logic flow and wording. Visual noise must be avoided and the display areas kept as uncluttered as possible.

Another important aspect is the need to ensure that displays do not violate the limits of human information processing. For example, to ensure good detectability and legibility, the font and dimensions must conform to research done on texts in visual displays. Decisions regarding polarity, illumination, color and contrast must be made in reference to knowledge of visual perception and must be based on the results of small-scale in-shop tests. Principles of perceptual organization and discrimination must be applied to the design and grouping of text and control areas on various parts of the display area so as to facilitate readability and integration of the presented material.

The intention must be to emphasize communication and to reduce new learning to a minimum when using the screens and understanding the system's logic. Paying attention and learning requires energy which will take away from concentrating on the content. Attention spans are limited under travelling conditions.

For example, if the CANCEL key is always in the same place on every screen, the user will soon learn where it is. The same is true for receiving or sending a message. The result is that finding the place on the screen will become automatic.

A user's short term memory has a capacity for a maximum of seven new items. The user also needs a visible list of what is currently happening. Visual cues prevent forgetting. Use of typefaces should be consistent throughout. If typefaces are changed - which may or may not be intentional - the user detects the difference and may become confused. Information redundancy is important but should not be overused. The information transmission rate is speeded up when all the stimuli generate responses which are already thoroughly learned and are essentially automatic. The rate is slowed down when each response requires thinking or reassuring in order to decide what to do.

3.4 Product design

The objective is to design a portable two-sided dialogue device which is situated between the agent and the passenger, probably on the counter. One side should be used by the passenger to receive messages and make selections, the other side by the agent to ask questions, provide solutions and send answers. Each side must interface with hardware components and visual displays. Both users will operate at the same time and require independent input/response controls. The design should suggest which technology is used and prepare the user so that he/she knows what to expect. The unit should provide components which let it be handled by the agent, but not by the passenger, e.g. moving it along the counter, unfolding it for operation, folding it back up for display or storage.

When choosing materials it is important to take into account wear and tear at a counter, transport to and from counters, static charging during operation, moderate temperature increases, fan noise, vibration and tactile interfacing aspects.

In terms of semantics, the question arises of which perceived value this unit should represent as a product. Should it be identified as part of the "check-in" equipment or related more to "dialogue" equipment? For both categories, certainly "quality" comes to mind. Something it should not represent is stigmatized "handicap" equipment.

Dimensions at this point in the development will largely be determined by the available technology and by off-the-shelf components for power supply, computer components, display screens and response controls.

Ideally, the unit should be light-weight for transport to and from the counter, yet heavy enough to prevent tipping when in use by the agent and passenger.

3.5 Technical

A primary concern must be to ensure that the chosen technology is able to establish a dialogue between the agent and passenger faster and more ergonomically efficient than is possible through existing methods. In addition, the technology must be capable of enabling communication in the two working languages used on the agent's side and in a minimum of four languages on the passenger's side. The system must allow cross-translation from either side.

Ideally, a dialogue unit would work on an independent power supply, e.g. batteries, to satisfy the requirement for mobility. Nevertheless, each counter is usually outfitted with a standard 115 V AC outlet which can also be used.

Visual display components should be flat to prevent distortion, should have high contrast and provide ergonomically acceptable color selections. If touch technology is considered, attention must be paid to glass plate thickness for parallax problems and to sensitivity for touch areas.

The technology should withstand 18 hours of continuous operation as well as the occasional bump and knock.

3.6 Technology Review

In order to address operational, ergonomic and user requirements, the following technical aspects were established:

- small and light weight display screens with flat surface, non-glare, no distortion;
- good letter/background contrast;
- touch capability for screen;
- size to allow display of full sentences;
- low power consumption;
- reliable and durable for use at counter environment;
- available as off-the-shelf item at reasonable price.

The technology investigated at the time of development and applicable for this project consisted of:

1. Monochrome Liquid Cristal Display (LCD) technology, as used in typical laptop computers;
2. Gas-plasma display;
3. Electroluminescent display.

Other display technologies such as vacuum fluorescent displays (VFDs), electrophoretic displays, light emitting diode (LED) displays and Cathode Ray Tube (CRTs) are not applicable because of their size, weight, curved screen, reliability or otherwise.

1. LCDs

LCDs offer many advantages: small size, light weight, low power consumption and good resolution, typically 640 by 480 pixels. Color LCDs currently are available only in relatively small sizes. Many are 10 cm (4") diagonal, 8,9 cm (3½") viewable displays with 480 by 200 pixel resolution. Larger LCD color displays are presently under development by many companies. Some disadvantages still exist, such as poor readability in low ambient light and low contrast. This has been offset by using rear lighting, which in return requires higher power consumption. The trade-off is between readability and power consumption. The other problem is the production of larger screens, such as 23 cm (9") displays, because of low throughput and manufacturing yield or current photomasking equipment.

2. Gas-Plasma Displays

Gas-plasma displays operate by exciting a gas, usually neon or an argon-neon mixture, through the application of a voltage. When the gas is excited it emits an orange-red light. Because gas-plasma displays produce light, they need no backlighting. Still they use more power than a backlit LCD.

Gas-plasma displays have faced many problems. Their lack of full color capabilities, their relatively short life span, and their cost have all contributed to their slow emergence. In addition, a thick glass plate cover adds significantly to the weight and parallax problems.

3. EL-Displays

EL-displays operate on the principle of electroluminescence - phosphors emitting light in the presence of an alternating electrical field. EL-displays are becoming increasingly popular in military and industrial applications where portability and reliability in hostile environments are required. Their truly solid-state construction make them rugged. EL-displays offer better contrast and broader viewing angles than gas-plasma and LCD displays. They use more power than LCDs but less than gas-plasma and considerably less than CRTs. While EL-displays are rugged and feature excellent contrast, they are still quite expensive. EL-displays are also primarily offered in monochrome configurations. Full color EL-displays have been hampered by difficulties in producing a good blue phosphor, but are expected to be on the market by the end of 1990.

In concluding, the comparison of the different technologies investigated indicates that the EL technology seems to be the best suited to address the requirements of this project. Its reliability, weight, size and contrast capabilities are superior to the others. With the development of full color, the future of two-dimensional display technology points in the EL-display direction. The only drawback at this point is its high price, which will undoubtedly come down, once larger production/sales are achieved.

4. CONCEPT DESIGN

4.1 Design configurations

Based on the foregoing requirements, the project team set out to address three main aspects for a dialogue device: three-dimensional configurations that would physically interface with the passenger and the agent; the two-dimensional display design, system logic and programming; and the operations.

The first design approach consisted of a two-sided board, each side divided into two sections, one for display and one for "word" selections. The passenger and agent would compose questions and answers accordingly and send them to the other side for display. In some instances words would be replaced by symbols, e.g. for smoking, non-smoking, aisle, centre, window, etc.

This approach had a number of drawbacks, mainly the problem of learning where the words or symbols were located on the board. The other problem was the difficulty in composing intelligent sentences without pronouns, tenses, specific verbs and so on.

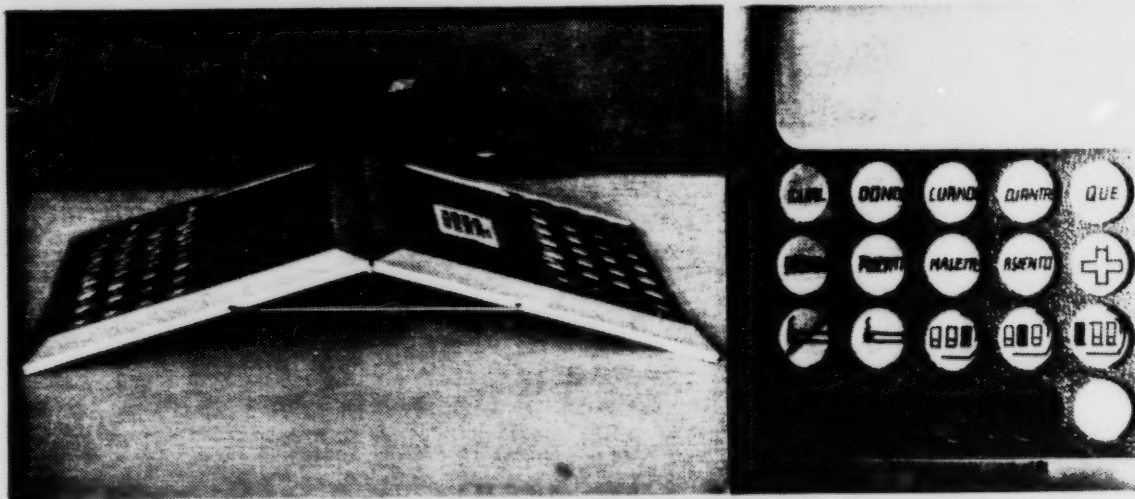


Fig. 1, First design approach

The second approach was for both the agent and passenger to use a touch screen, with the agent sending messages and the passenger answering only "Yes" or "No". This approach seemed to be the best way to reduce the memory load on the passenger's side to a minimum. Small-scale in-house tests with 10 subjects were conducted by an ergonomist in order to evaluate the yes/no mode against the full sentence/choice mode. The results indicate a preference for the full sentence/choice mode because the users can be more involved in the decision-making process.

In the meantime, the analysis for an appropriate display technology offered the following choices:

1. flat screen LCD display with separate input/response controls,
2. flat plasma screen with touch capabilities,
3. flat electroluminescent screen with touch capabilities.

The flat electroluminescent touch screen was chosen because it is the most advanced technology and is the one which would best suit ergonomic requirements.

The LCD display was discarded because of low contrast and poor legibility under terminal light levels. The plasma screen has the advantage of being composed of a thick, heavy glass plate but this increases parallax, causing problems especially in touch screen use.

The next step was to determine which hardware would be required to operate the system. An AMPRO Little Board/186 with 512 K bytes of RAM and a 750 K mini floppy disk were specified for program and file storage, and two RS 232 serial ports for the communication channels. The operating system would use a MS DOS version 3.2. The power supply, the disk drive and the computer boards were packaged in the smallest volume possible of approximately 30 cm (12") wide, 23 cm (9") long and 9 cm (3 1/2") high. Because of its weight and stability, it was decided that this portion could form the central bridge and could easily be placed on top of the counter. Connected to this central component, the screens would pivot into their respective working positions, one on

the agent's side, and the other on the passenger's. To touch the screen with a finger, resting the hand and reading the display at the same time, an angle of 5 degrees below the horizontal was found to be most suitable.

A mock-up of this configuration was built to verify dimensional and ergonomic aspects.

Do you prefer an aisle seat
YES NO

Fig. 2, Yes/No mode screen

Which seat do you prefer?	
WINDOW SEAT	☐
AISLE SEAT	☐
CENTRE SEAT	☐
CANCEL	CONFIRM

Fig. 3, Sentence/choice mode



Fig. 4, Mock-up agent side



Fig. 5, Passenger side

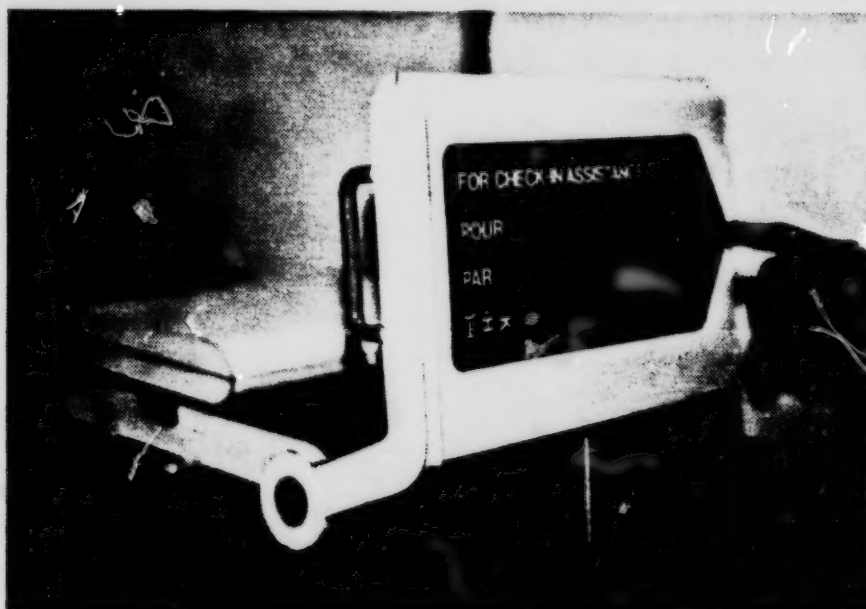


Fig.6, Mock-up, display mode

4.2 Final design

The final design of Translaid represents a counter-top device to be placed on an airline check-in counter. Two flat monochromatic touch screens pivot into their working positions, one for a passenger's use, and the other for an agent's. The central component houses a power supply, a disk drive, computer boards, the main switch with fuse, and a muffin fan for cooling. The top of the central unit, to be used as the surface for document exchange, has raised rubber dots to facilitate the handling of such documents. Air vents are located on all sides to dissipate heat generated by the power supply. On each long side there are handles to lift and transport the unit, and on one of these sides there is an opening for a floppy disk and a control light. On the agent's side there is a small red flashing light which signals that a passenger requests assistance.

The two screens are flat touch screens, recessed slightly into a flat panel surface on all four sides, allowing the user's hand to rest during operation. The unit is connected by one cord to a 115 V AC outlet standard electrical plug.

In its display position on the counter, the back of the passenger screen faces the public side, indicating in four languages to touch a key when help is requested.

The general appearance of the unit, as shown in Figure 7, is dominated by the volume of the computer hardware and the flat screens. The designers intended to keep the unit small and light but the available technology is still heavier than desired. Ergonomic field testing and further technical investigations will reveal if the present unit can be separated into smaller and lighter components.

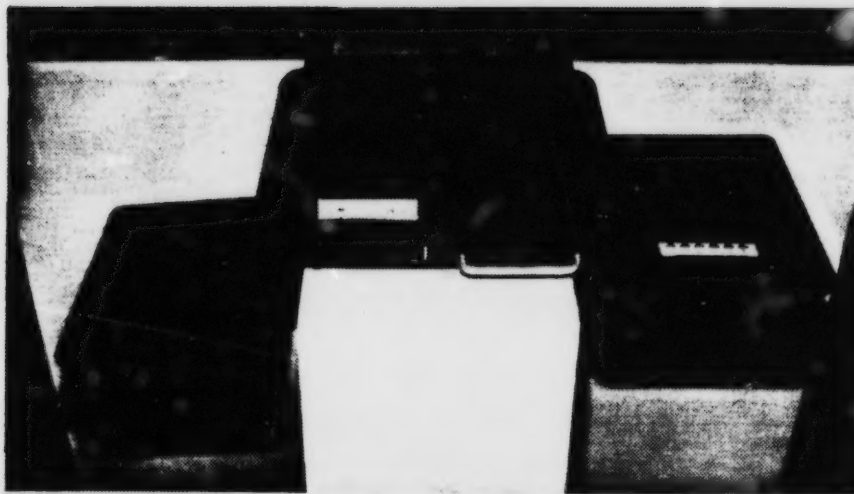


Fig. 7, Prototype, Translaid



Fig. 8, Area for document exchange

4.3 Display design

Although Translaid is seen as a device that could be used in any type of transportation terminal with demands for translation and dialogue, its novelty as a product dictated that the Mark I prototype be developed with the capability for only one transportation mode and for only a limited number of languages. Air was selected as the mode because it presented the most comprehensive set of problems. The languages chosen were English and French for the agent, and English, French, Spanish and Chinese for the passenger. Special emphasis was placed on the ergonomic design of the system logic and of the agent and passenger screen displays.

Both the agent and passenger screens are divided into three sections. The top section of each screen displays the message sent from the other side in the language selected by the user. The middle section of each screen displays the choice of inquiries or responses. A touched choice is sent to the other side.

Six scenarios of airport passenger check-ins are covered - ticket request, passenger identification, special seating selection, seat assignment, baggage request, and boarding pass issue. After one of the scenarios has been successfully "completed", the program proceeds automatically to the next logical one.

The system obviously had to be user-friendly, allowing the agent to back up or skip any of the above-mentioned check-in modes, but taking the load on memory as to the current mode, and systematically exhausting all those relevant. Moreover, it had to be possible for the agent to search for additional information, switch to the alternate working language, or re-initiate the flow of procedures. Furthermore, it had to allow both the agent and passenger to cancel and correct selections made in error.

4.4 Operation

Upon arriving at the check-in counter, a hearing, speech or language impaired passenger will find Translaid in display position on the top of the counter. A display facing the passenger indicates in four different languages that assistance is available by pressing a key. This activates a visual/auditory signal on the agent's side which alerts him/her. The agent then slides the unit into its place and pivots both screens into their respective working positions. Each dialogue member then selects a language - the agent chooses either English or French, and the passenger one of the four languages offered (English, French, Spanish or Chinese).

The agent's first screen, shown in Figure 8, is designed to initiate the check-in procedure. The following features of this screen are common to all agent screens. For example, the list of modes (scenarios) is placed off-screen to the left in order to conserve space. An arrow at the far left of the screen indicates the mode the system is currently in, while BACK UP and NEXT MODE touch areas allow the agent to refer to a previous mode or to change the order. The RESTART and language touch areas appear on every screen, thus enabling the agent to go back to the beginning or, if desired, to switch to the alternate working language.

The diagram shows a rectangular screen interface. At the top right are two buttons: "RESTART" and "FRANCAIS". A horizontal line separates this header from the main content area. On the left side, there is a vertical list of options: "TICKET •", "ID •", "BAGGAGE •", "SEAT. S •", "SEAT. R •", "BOARD. •", and "PASS". To the right of this list is a left-pointing arrow. Further right are two buttons: "BACK UP" and "NEXT MODE". In the center of the screen, there are four options, each followed by a small square checkbox: "REQUEST TICKET", "PROBLEM WITH TICKET", "PROBLEM WITH FLIGHT", and "TOO EARLY FOR CHECK-IN". Another horizontal line is below these options. At the bottom left, there is text: "Please present your ticket." and "If you do not have a ticket, please select:". To the right of this text are two buttons: "CANCEL" and "SEND".

Fig. 9,
Agent's first
screen

Other features shown in Figure 8 are common to both agent and passenger screens. All screens are divided by a double horizontal line in three sections to render the functions and operations of the system maximally discriminable and to reduce the load on user memory. Right-justified messages that can be sent to the dialogue partner are prominently displayed in menu form in the middle section of the screen with square touch areas that are readily distinguishable from the rectangular meta controls. When a square is touched, the relevant message appears in reverse and at the bottom area of the screen, thus providing feed-back so the user can verify that the selection was the one intended. When CANCEL is touched the message does not appear on the partner's screen until SEND is touched.

A lay-out of the passenger screen during the ticket mode (Figure 9) illustrates how the first part of the check-in dialogue occurs.

Please present your ticket.
If you do not have a ticket, please select:

I WISH TO PURCHASE A TICKET AND BOOK A FLIGHT ☐

MY TICKET IS PRE-PAID-I WISH TO BOOK A FLIGHT ☐

MY FLIGHT IS PRE-BOOKED-I WISH TO PAY NOW ☐

I HAVE LOST MY TICKET ☐

CANCEL

SEND

Fig. 10, Passenger screen

Not all phases of the procedure were as simple to design as that covered by the first screens in the TICKET mode. SEATING, for example, introduced considerable complexity to problem solving activities since, apart from the usual indication of preference for window, aisle or centre, special needs of the disabled population had to be considered, e.g. near bulkhead, washroom, etc. A first approach to the problem was to divide the seating selection dialogue into two system modes: SEATING (Special) and SEATING (Regular). Figure 10 shows the complete passenger screen. However, depending on the availability for a specific flight, the passenger will only be presented with the remaining choices in order to shorten the dialogue time. Figure 11 indicates the choice for SEATING (Regular) and requests that the SELECTION COMPLETE area be touched for confirmation. Again, only touch areas for the types of seating available appear on the screen. In the case of a conflict between availability and passenger preference, further dialogue occurs in question/answer form until a satisfactory compromise has been reached.

Please indicate special seating requirements

FRONT	MIDDLE	REAR	NONE
NEAR WASHROOM	NEAR BULKHEAD	ADJACENT SEATING	SELECTION COMPLETE

CANCEL

SEND

Fig. 11, Seating (Special) screen

You have requested special seating: Near Washroom.
Now please indicate where you would like to sit:

WINDOW	CENTRE	AISLE	SELECTION COMPLETE
--------	--------	-------	-----------------------

CANCEL

SEND

Fig. 12, Seating (Regular) screen

The other area of complexity was TICKET PURCHASING. A number of new choices had to be introduced such as dates, numeric input for time and price, flight schedules and destinations.

Figures 12-15 show screens of Canadian destinations listed in alphabetical order, dates, flight selection and numeric input.

Please touch your choice of destination

CALGARY	HAMILTON	MOOSE JAW	CONTINUE
EDMONTON	LONDON	PRINCE RUPERT	
FREDERICTON	MONTREAL	QUEBEC-CITY	
HALIFAX	WINSTON	ST. JOHNS	

CANCEL

SEND

Fig. 13, Destination, passenger screen

Please touch your choice of date:

JUNE 1990

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

CANCEL

SEND

Fig.14, Date, passenger screen

The following flights are available. Please select:

AC 105 09:05 AM E,Y,F	AC 209 19:10 PM F,Y,E
AC 117 12:10 PM F,E	AC 211 22:05 PM E
AC 114 14:08 PM E,Y,H	

CANCEL

SEND

Fig.15, Flight selection, passenger screen

TICKET •

ID •

BAGGAGE •

SEAT. S •

SEAT. R •

BOARD. •

PASS •

RESTART

FRANÇAIS

BACK
UP

NEXT
MODE

7	8	9	.
4	5	6	
1	2	3	0

ENTER

The cost of the ticket is \$----

Is this satisfactory?

CANCEL

SEND

Fig.16, Numeric screen, agent screen

5 CONCLUSIONS

The original objective - to develop and build a counter-top device for facilitating dialogue between the target group and the agent at the check-in counter - was successfully achieved.

The combination of applying advanced technology with a human factors design approach resulted in a user-friendly Mark I prototype for use at air terminals. However, the system can quite readily be adapted for use at rail, bus or ferry terminals. Moreover, languages can be added to suit the situation.

The ergonomic evaluation indicated a great enthusiasm on the part of agents and passengers. Both parties expressed the need for providing such devices at the check-in counters in order to improve dignified dialogue and customer service.

As can be expected, the first stage of development also brought into light areas where improvements and modifications have to be made.

In the system's design:

- improve compatibility with the present airline reservation system;
- modify display design for calendar and numeric input;
- develop a generic system suitable for the use of different carriers and terminal data.

In the hardware design:

- reduce weight of power supply or separate components;
- adapt design to recent new counter designs in terminals;
- improve screen positions for reducing ambient light reflections.

6 RECOMMENDATIONS

It is recommended that two pre-production prototypes be built with the above-mentioned improvements and modifications. Two different software packages for two airlines should be made available and one unit should be tested by each airline to determine and assess potential market implementation. The development of a generic system would greatly increase the potential for its use by other carriers and in other critical dialogue situations in terminals such as for customs and immigration, security and in waiting lounges.

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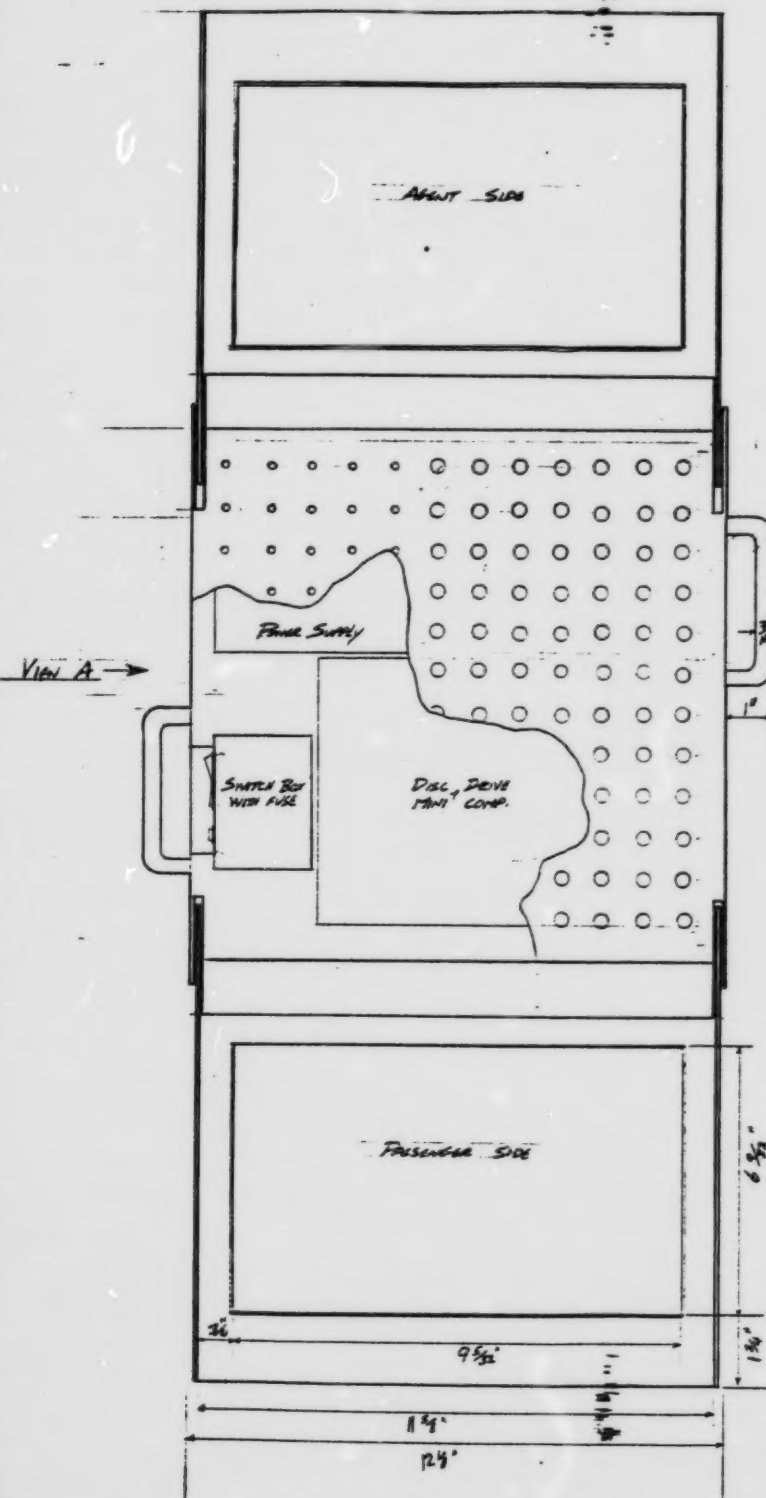
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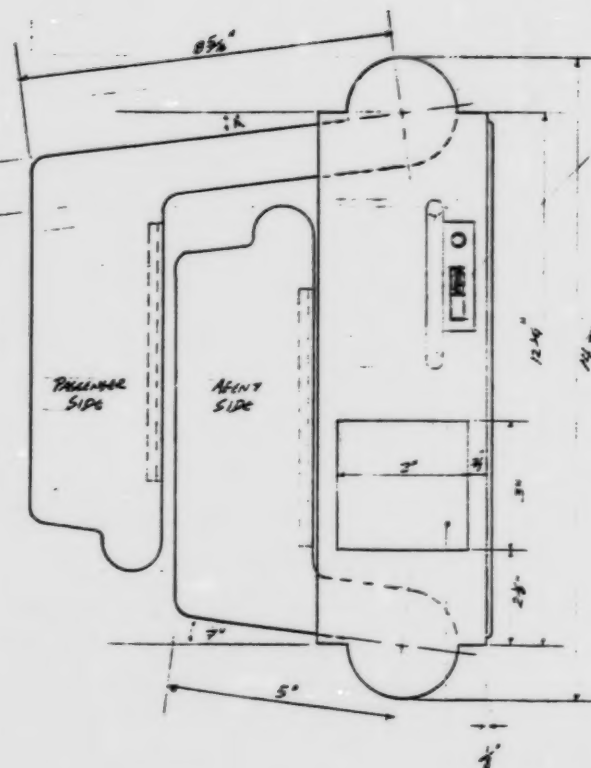
APPENDIX A

TECHNICAL DRAWINGS

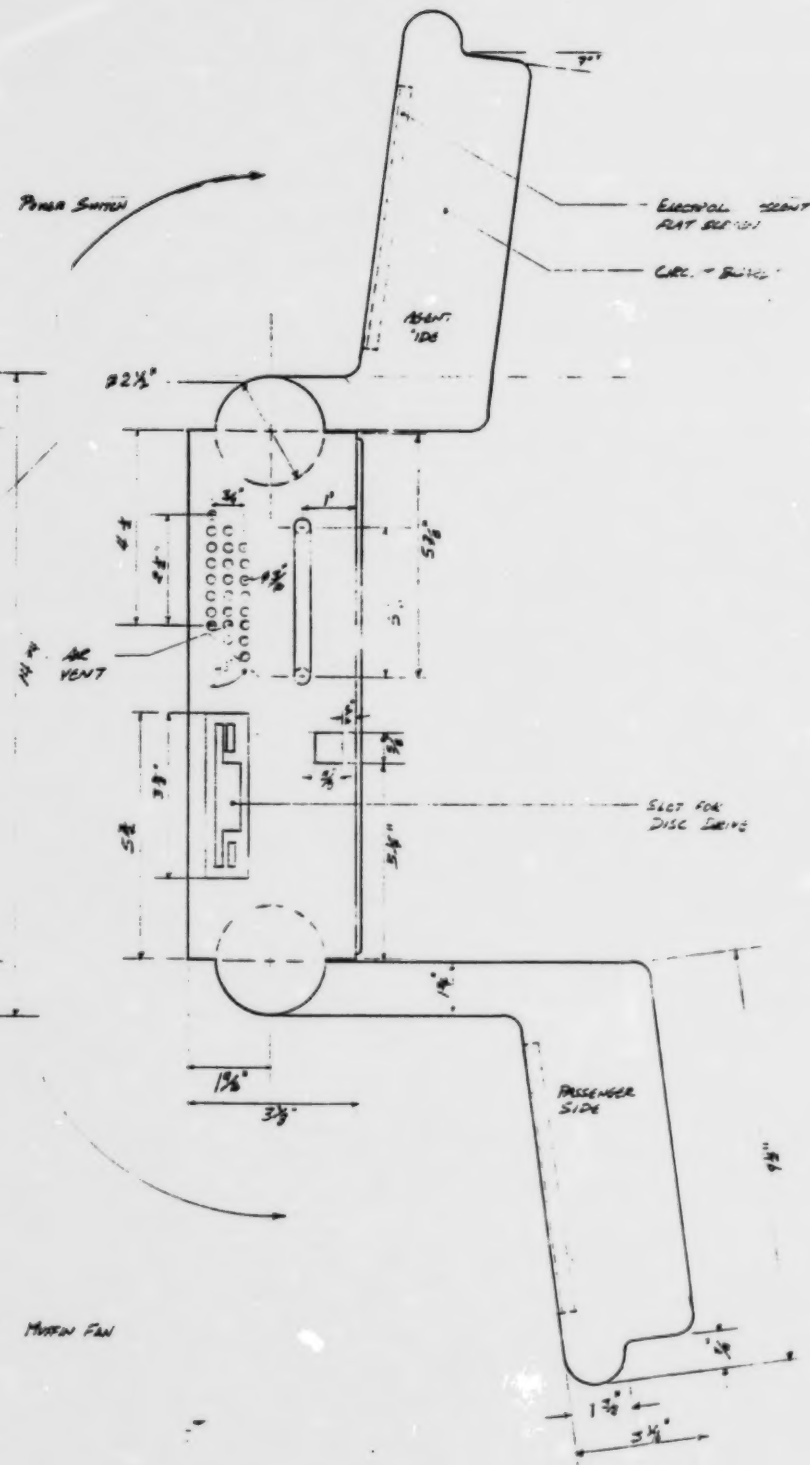
TOP VIEW



VIEW A
NOT IN USE (CLOSED)



VIEW B
IN USE (OPEN)



APPENDIX B

SYSTEM DOCUMENTATION

TRANSLAID SYSTEM DOCUMENTATION

PREPARED BY

Jim Woolsey

STR Speech Technology Research Ltd.

STR Technical Report No. TR9001

May 1990

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1. INTRODUCTION

Translaid is a device that is intended to aid communication between an airport ticket agent and an airline passenger. It consists of two touch screens, one for the passenger and one for the agent. These are joined through a computer that controls programme flow and transmits messages from one screen to the other. A query that is chosen by the agent when an appropriate part of the screen is touched is displayed on the passenger's screen. If necessary, it is translated to the passenger's language. The passenger's response that is also chosen when the passenger touches the appropriate part of the screen is translated to the agent's language and displayed on the agent's screen. Currently the languages that are implemented are French and English for the ticket agent and French, English, Spanish, and Chinese for the passenger.

2. Hardware

The computer that is used is the AMPRO Little Board/186. It is configured with 512K bytes of RAM and a 720 K mini floppy disk for programme and file storage. The communication channels consist of two RS232 serial ports. The operating system that is used is MS DOS version 3.2

The two screens that are used are Digital Electronics M320ST touch screens that are connected to the computer through the two serial communication ports of the computer. An infrared touch sensor detects touch responses on the screens. The screens have a screen resolution of 640 x 400 pixels, and a character resolution of 8 x 16, thus allowing 80 character columns and 25 character rows. Each screen also has 4 predefined character sets, and room for up to five user definable character sets of 94 characters each. The predefined sets are used for all languages except Chinese which is handled through with user defined characters. The screens permit touch areas or buttons to be defined. These can be made to respond to the computer in specified ways. Screen modes can also be defined in which sets of buttons are active while other buttons are made inactive.

3. Software

The fundamental design of the Translaid software is to implement a conversation interface. Both the agent and passenger screen are divided into three parts. The top part of each screen displays the message sent from the other screen, and it is in the language that is active for that screen. The middle part of each screen displays a choice of queries or responses that can be sent to the other screen. And the lower part of each screen displays the message that has been sent to the other screen.

Six broad areas of airport passenger check-in are covered, namely ticket request, passenger identification, special seating needs selection, seat assignment, baggage request, and boarding pass issue. The programme proceeds from one of these areas to the next logical area when that area has been successful "completed", or when the agent touches a button that causes the programme to move back to a previous area or forward to the next area.

Each of these areas consists of a network of numbered nodes. Transition from one node to the next occurs when an active button is touched. A button touch can be canceled by touching a "CANCEL" button before another selection button has been touched. A node description consists of a list of phrases designators and a list of

transitions. The phrase designators are simply references to phrases, and the transitions are button designators and the number of the node that the designated button activates. The contents of the screen depend on the current active language for that screen, the text referenced by the phrase designator, and any possible message from the previous node.

The transitions from one node to another are described by a transition table. The transition table and the phrases for each available language are kept in disk files. To change the programme flow or to change the phrases, it is only necessary to edit these files. At start up time, the transition table and the text is loaded into the computer memory to allow fast access.

There is other text that is used by the programme that is not located in the phrase files. This text is mainly instructional text that directs the users in the use of the programme. Most of this text is included in the software itself. There are some exceptions to this due to developmental changes and requirements.

There are five special node definitions that cause particular kinds transitions within the programme. These are used by nodes that deal with flight destinations, departure times, choice of flights, selection of special

needs seating, and seat assignment. They are triggered by codes in the transitions tables.

There are two other information files that are kept on disk that are required by the programme. A flight schedule is referenced when flight selection is made. To remain current this file would have to be updated when changes in the flight schedule are made. A list of hotel names is also required when hotels are offered through the programme.

The main advantage of keeping the transition table and information in text files is that it can be changed without changing the source code of the programme. Small changes can be made by non-technical personal. This can be such things as correcting spelling mistakes or making changes to the wording of phrases.

The main disadvantage is that the transition tables have become relatively complex. When comprehensive changes are needed, care must be taken to ensure that the transition tables do not become inconsistent or that nodes become isolated without transitions to them. Users will not normally be able to make changes to the tables, and programmes have had to be written to ensure table consistency. This is in part because of the size of some of the tables, and in part because of the fluid requirements

throughout the development of the software. Currently there is detail in the transition table that was necessary at one time but now belongs elsewhere in the programme. To change it, at this time, would require a substantial reprogramming effort which could be reversed as further changes are required.

The implementation of the Chinese character set presented its own peculiar problems. The Chinese character set consisting of all Chinese characters used by the current version of the programme is stored in a binary disk file and is not modifiable by users. This is loaded into memory during the programme initialization. Since each Chinese character consists of six character cells, a maximum of 75 Chinese characters can be downloaded to an individual screen and displayed on the screen at any given time. Therefore, if Chinese is the active passenger language, the available characters in memory must be constantly updated as transition is made from one node to another.

4. State Transition Descriptions

The state transition table for the Translaid Programme is composed of two main components, (1) a set of nodes with a description of each node, and (2) a set of node descriptors.

4.1 NODES.

Each node has an identification number (column 1), a node control value (column 2), and a set of one or more transitions (see APPENDIX I). A transition consists of two parts. The first is the "input", which has values in the range 1 to 8. Values 1, 2, 3, and 4 correspond to inputs from the passenger screen, and are given direct association with the selection buttons on the passenger screen. Values 5, 6, 7, and 8 correspond to inputs from the agent screen, and are also given a direct association with the selection buttons on the agent screen.

The second part of a transition is the destination node. For instance, if the system is in control of the node defined by line two of the Node Transition Table where the first transition pair consists of 05 and 13, and if the passenger "touches" the top selection button on the touch screen, the next active node will be node 13. Destination node values can have special meanings. Negative values indicate a module change. This will be discussed later.

Values greater than 511 indicate special subfunction requirements of the programme such as display calendar, display destinations, or display schedules for a given destination and time. For values greater than 511, the actual destination node can be extracted from the value by doing an arithmetic AND between the value and 511. A transition to undefined states is illegal.

The node control value (the second value in the NODES) controls particular actions when that node is active. It determines the screen that is to be active and the sequence of highlighting that is to be done. There are sixteen possible values, although Translaid uses only eleven.

The set of nodes is divided into two levels. The first level controls the entry to the seven modules of the programme. This number of the nodes must not be changed for this version of the programme. These are executed sequentially starting with (1) "determination of the passenger language", followed by (2) "ticket and flight information", (3) "identification request", (4) "special seating needs", (5) "regular seating needs", (6) "baggage request", and finally, (7) "boarding pass issue". A restart always returns to "determination of passenger language". The transition from one module to another is determined by the return value from the execution of the module. This

return value is defined by the transition table as follows:
A state transition to -1 causes the next module in the sequence to be executed, a state transition to -2 causes the next module in the sequence to be skipped, and a return value of -3 causes a restart.

The second level in the in the set of nodes defines all state transitions within the seven modules, including normal transitions to subsequent modules.

4.2 NODE DESCRIPTORS

Associated with each node is a node descriptor that describes the screens when that node is active (see APPENDIX II). Each screen is divided into three main sections. The top of each screen displays the message the is sent from the other screen. For the agent this is designated screen 000 and for the passenger it is designated 003. The mid part of each screen is the selection area. For the agent this is designated 001 and for the passenger it is designated 004. The bottom of the agent screen displays messages that have been sent to the passenger. It is designated screen 002. The bottom of the passenger screen displays special messages. It is designated screen 005.

Each node descriptor consists of an identification number (column 1) that corresponds to the node, and a set of

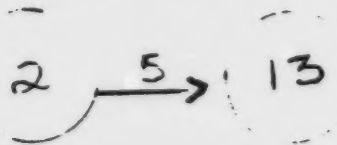
phrase descriptors. For example, in line two of the Node Descriptors, there are four phrase descriptors while in line thirteen there are fourteen phrase descriptors. A phrase descriptor consists of three parts: first, a screen number, second, a line number, and third, a phrase number. The phrase number corresponds directly to the phrases that can be found in the phrase files (see APPENDICES IVa, IVb, IVc, IVd). The line number indicates approximately where the phrase is to appear in a window. The meanings of the screen number varies depending on the value. If the screen number is between 000 and 005 the phrase is to appear on that screen. If the value is between 033 and 039, the phrase is a response phrase that will appear on the top screen of the next mode if the appropriate button is touched. To determine the button the value 32 is subtracted from the screen number. For instance, if the phrase descriptor is the set 033 01 044 as in Node Descriptor 23, then if the passenger touched the top selection button, phrase number 44 will appear at the top of "agent screen 00" when the next node is given control.

For every transition that appears in a node transition, there must be a phrase specified in the corresponding Node Descriptor. For example, node 24 contains two transitions, one for the first button on the "agent screen" and one for the second button of the "agent screen". The node descriptor 24 specifies phrase number 45

is to be placed at position 1 of the "agent selection screen" and phrase number 32 is to be placed at position 2 of the "agent selection screen".

4.3 FLOW CHARTS.

The flow charts give a visual presentation of the transitions defined by the nodes in the state transition table (see APPENDIX III). Each flow chart contains a set of circles containing numbers. The circles represent the node and the numbers represent the NODE identification numbers. Lines with arrows are used to connect circles with other circles. Associated with each line is a number. The lines represent possible transitions from one node to another, and the numbers represent the button touches (see section I for exact meanings of the numbers). In the following example, if there is a key press associated with 5, there is a



transition for node 2 to node 13.

APPENDIX I.

NODE TRANSITIONS

1	1	01	-1	02	-1	03	-1	04	-1
2	2	05	13	06	53	07	65	08	66
3	6	05	93	06	95				
4	2	05	105	06	106	07	107		
5	2	05	127						
6	6	05	121						
7	2	05	-1	06	66	07	-3		
13	9	01 06	14 53	02 07	20 65	03 08	34 66	04 43	05 13
14	6	05	2063						
15	10	05	1040						
16	10	05	4115						
17	9	01	61	02	61	03	61		
18	6	05	-1						
19	6	05	17						
20	6	05	2069	06	28				
21	10	05	1046						
22	10	05	23	06	-2	07	25		
23	7	01	24	02	24	03	24		
24	6	05	-2						
25	9	01	26	02	27				
26	14	05	4115						

27	14	05	-3					
28	2	05	29	06	32	07	33	
29	7	01	30	05 2069	06	31	07	-3
30	6	05	2069	06	31	07	-3	
31	6	05	2069	06	31	07	-3	
32	7	01	30	05 2069	06	31	07	-3
33	7	01	30	05 2069	06	31	07	-3
34	6	05	2083	06	37			
35	10	05	1060					
36	10	05	-2	06	25			
37	2	05	38	06	41	07	42	
38	7	01	39	05 2083	06	40	07	-3
39	6	05	2083	06	40	07	-3	
40	6	05	2083	06	40	07	-3	
41	7	01	39	05 2083	06	40	07	-3
42	7	01	39	05 2083	06	40	07	-3
43	6	05	2092	06	47			
44	10	05	1069					
45	10	05	-2	06	46	07	25	
46	9	01	18	02	18	03	18	
47	2	05	48	06	51	07	52	
48	7	01	49	05 2092	06	50	07	-3
49	6	05	2092	06	50	07	-3	
50	6	05	2092	06	50	07	-3	
51	7	01	49	05 2092	06	50	07	-3
52	7	01	49	05 2092	06	50	07	-3
53	2	05	54	06	55	07	64	

54	3	05	-3						
55	9	01	56	02	-3				
56	6	05	2105						
57	10	05	1082						
58	10	05	4155						
59	6	05	60						
60	9	01	61	02	61	03	61		
61	6	05	-1	06	62	07	63		
62	11	05	-3						
63	11	05	-3						
64	7	05	2105						
65	3	05	66	06	67	07	79	08	87
66	11	05	-3						
67	6	05	68	06	71	07	75	08	76
68	9	01	61	02	69	03	70		
69	6	05	-3						
70	6	05	2063						
71	9	01	72	02	74	03	69	04	70
72	6	05	73						
73	11	05	-3						
74	6	05	-3						
75	9	01	61	02	69				
76	9	01	77	02	74	03	69	04	70
77	6	05	78						
78	11	05	-3						
79	2	05	80	06	82	07	84	08	86
80	11	01	81	02	69	03	70		

81	6	05	62	06	-2						
82	9	01	83	02	74	03	69	04	70		
83	11	05	-3								
84	9	01	77	02	85	03	69				
85	6	05	-3								
86	6	05	-3								
87	2	05	80	06	82	07	84	08	86		
93	9	01	94	02	94	03	94	05	93	06	95
94	6	05	95	06	-1						
95	2	05	96	06	97	07	98	08	99		
96	3	05	95	06	-1						
97	3	05	95	06	-1						
98	9	01	94	02	94	03	94				
99	9	01	94	02	94	03	94				
105	11	01	109	05	108	06	-3				
106	11	01	109	05	108	06	-3				
107	11	01	109	05	108	06	-3				
108	6	05	108	06	-3						
109	6	05	108	06	-3						
121	1	01	-1	02	6						
127	3	05	-3								

APPENDIX II

NODE DESCRIPTORS

1	004 01 005	004 02 006	004 03 007	004 04 008
2	001 01 009	001 02 010	001 03 011	001 04 012
3	001 01 106	001 02 107		
4	001 01 033	001 02 042	001 03 043	
5	001 01 127			
6	001 01 124			
7	001 01 123	001 02 012	001 03 041	
13	001 01 009	001 02 010	001 03 011	003 00 013
	003 01 014	004 01 015	004 02 016	004 03 017
	004 04 018	033 00 015	034 00 016	035 00 017
	036 00 018	001 04 012		
14	001 01 019			
15	018 00 020	001 01 021		
16	017 00 022	001 01 023		
17	003 00 024	004 01 025	004 02 026	004 03 027
	033 00 028	034 00 029	035 00 030	
18	001 01 031			
19	001 01 032			
20	001 01 019	001 02 033		
21	018 00 020	001 01 021		
22	017 00 022	001 01 032	001 02 031	001 03 035
23	130 00 024	131 00 024	004 01 025	004 02 026
	004 03 027	033 00 028	034 00 029	035 00 030
24	001 01 031			
25	002 00 036	003 00 036	004 01 037	004 02 038
	033 00 039	034 00 040		

26	017 00 022	001 01 023		
27	001 01 041			
28	001 01 033	001 02 042	001 03 043	
29	003 00 044 001 03 041	004 01 045 033 00 045	001 01 019	001 02 046
30	001 01 019	001 02 046	001 03 041	
31	003 00 047	001 01 019	001 02 046	001 03 041
32	003 00 048 001 03 041	004 01 049 033 00 049	001 01 019	001 02 046
33	003 00 050 001 03 041	004 01 051 033 00 051	001 01 019	001 02 046
34	001 01 019	001 02 033		
35	018 00 020	001 01 021		
36	017 00 022	001 01 052	001 02 035	
37	001 01 033	001 02 042	001 03 043	
38	003 00 044 033 00 045	004 01 045 001 03 041	001 01 019	001 02 046
39	001 01 019	001 02 046	001 03 041	
40	003 00 047	001 01 019	001 02 046	001 03 041
41	003 00 048 033 00 049	004 01 049 001 03 041	001 01 019	001 02 046
42	003 00 050 033 00 051	004 01 051 001 03 041	001 01 019	001 02 046
43	003 00 053	001 01 019	001 02 033	
44	018 00 020	001 01 021		
45	017 00 022	001 01 054	001 02 055	001 03 035
46	130 00 024 004 03 027	131 00 024 033 00 028	004 01 025 034 00 029	004 02 026 035 00 030
47	001 01 033	001 02 042	001 03 043	
48	003 01 044 001 03 041	004 01 045 033 00 045	001 01 019	001 02 046

49	001 01 019	001 02 046	001 03 041	
50	003 00 047	001 01 019	001 02 046	001 03 041
51	003 00 048 001 03 041	004 01 049 033 00 049	001 01 019	001 02 046
52	003 00 050 001 03 041	004 01 051 033 00 051	001 01 019	001 02 046
53	001 01 056	001 02 057	001 03 058	
54	001 01 041	003 00 059	002 00 059	
55	131 00 060 033 00 061	130 00 060 034 00 062	004 01 061	004 02 062
56	001 01 019			
57	017 00 020	018 00 020	001 01 021	
58	017 00 022	001 01 023		
59	001 01 032			
60	003 00 024 033 00 028	004 01 025 034 00 029	004 02 026 035 00 030	004 03 027
61	001 01 031	001 02 063	001 03 057	
62	131 00 064	130 00 064	001 01 041	
63	003 00 065	001 01 041		
64	003 00 066	001 01 019		
65	259 00 067 001 04 071	001 01 068	001 02 069	001 03 070
66	130 00 072	131 01 072	001 01 041	
67	003 00 073 001 01 075	003 01 074 001 02 076	002 00 073 001 03 077	002 01 074 001 04 078
68	131 00 079 004 03 082	130 01 079 034 00 081	004 01 080 033 00 080	004 02 081 035 00 082
69	003 00 083	002 00 083	001 01 041	
70	001 01 019	003 00 084		
71	131 00 085 004 04 082 036 00 082	004 01 086 033 00 086	004 02 087 034 00 087	004 03 081 035 00 081

72	003 00 088	000 00 088	001 01 089	
73	131 00 090	130 00 090	001 01 041	
74	001 01 041			
75	131 00 091 004 02 081	130 01 091 034 00 081	004 01 080	033 00 080
76	131 00 092 004 03 081 035 00 081	130 01 092 004 04 082 036 00 082	004 01 086 033 00 086	004 02 087 034 00 087
77	003 00 088	000 00 088	001 01 089	
78	131 00 093	130 00 093	001 01 041	
79	003 00 094 001 01 095	003 01 074 001 02 096	002 00 094 001 03 097	002 01 074 001 04 098
80	131 00 099 004 03 082	130 00 099 033 00 100	004 01 100 034 00 081	004 02 081 035 00 082
81	001 01 012	001 02 031		
82	131 00 101 004 03 081 035 00 081	130 01 101 004 04 082 036 00 082	004 01 086 033 00 086	004 02 087 034 00 087
83	131 00 090	130 00 090	001 01 041	
84	131 00 102 004 03 081	130 01 102 033 00 088	004 01 088 034 00 103	004 02 103 035 00 081
85	000 00 103	001 01 041		
86	131 00 104	130 01 104	001 01 041	
87	003 00 105 001 01 095	003 01 074 001 02 096	002 00 105 001 03 097	002 01 074 001 04 098
93	001 01 106 004 01 110 034 00 111	001 02 107 004 02 111 035 00 112	003 00 108 004 03 112	003 01 109 033 00 110
94	001 01 107	001 02 031		
95	001 01 113	001 02 114	001 03 115	001 04 116
96	003 00 117	001 01 107	001 02 031	
97	003 00 118	001 01 107	001 02 031	

98	131 00 119 004 02 026 035 00 030	130 00 119 004 03 027	003 00 024 033 00 028	004 01 025 034 00 029
99	131 00 120 004 02 026 035 00 030	130 00 120 004 03 027	003 00 024 033 00 028	004 01 025 034 00 029
105	003 00 044 001 02 041	004 01 045	033 00 045	001 01 046
106	003 00 048 001 02 041	004 01 049	033 00 049	001 01 046
107	003 00 050 001 02 041	004 01 051	033 00 051	001 01 046
108	003 00 047	001 01 046	001 02 041	
109	001 01 046	001 02 041		
121	004 01 121	004 02 122	033 00 125	034 00 126
127	001 01 041	003 00 128	002 00 128	005 00 129

APPENDIX III

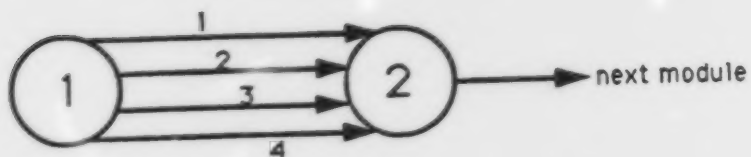
FLOW DIAGRAMS

- Appendix IIIa: Passenger Language Selection**
- Appendix IIIb: Ticket and Flight Arrangements**
- Appendix IIIc: Identification**
- Appendix IIId: Regular Seating**
- Appendix IIIe: Special Seating**
- Appendix IIIf: Baggage Request**
- Appendix IIIg: Boarding Pass**

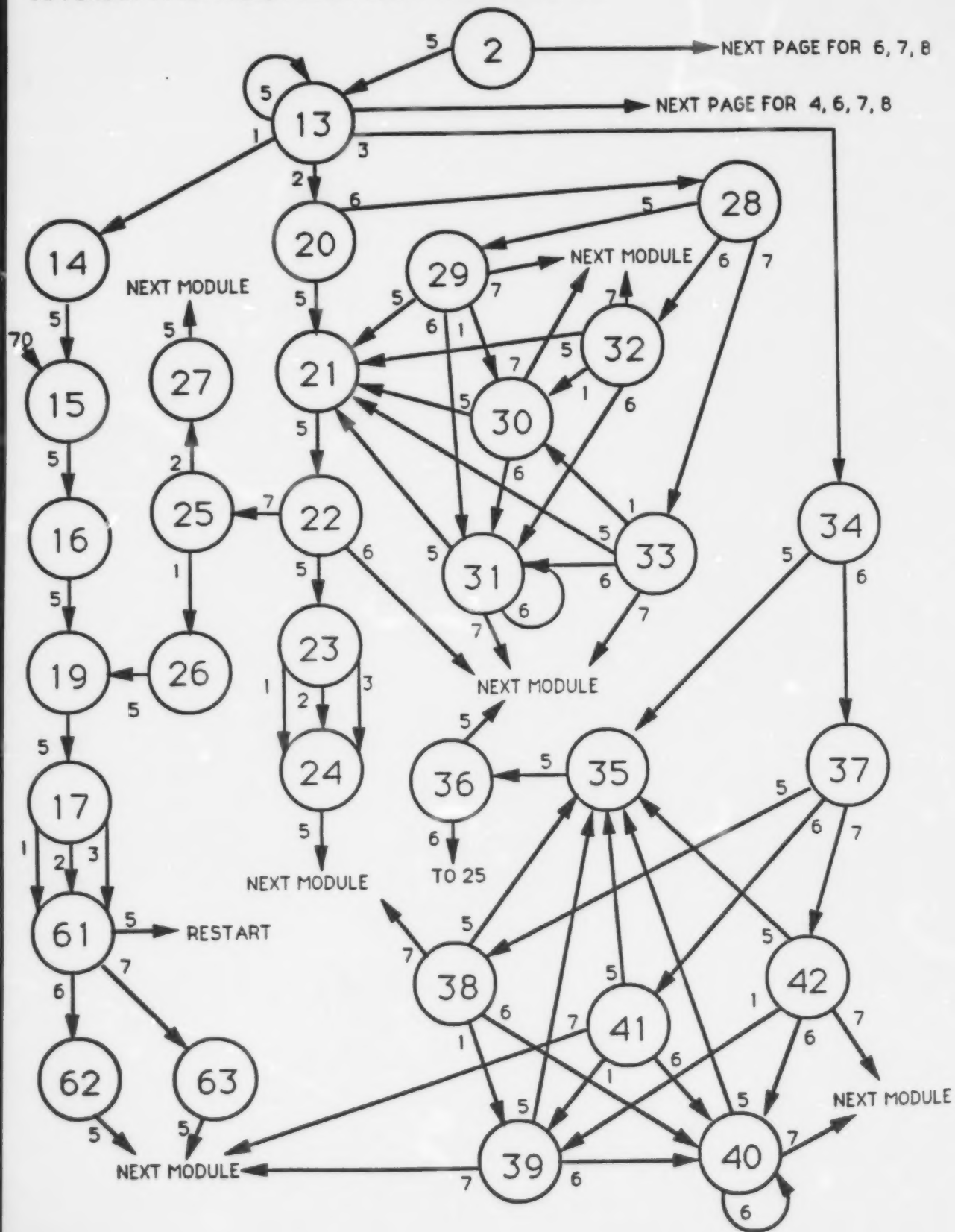
1, 2, 3, 4 PASSENGER BUTTONS 1, 2, 3, 4

5, 6, 7, 8 AGENT BUTTONS 1, 2, 3, 4

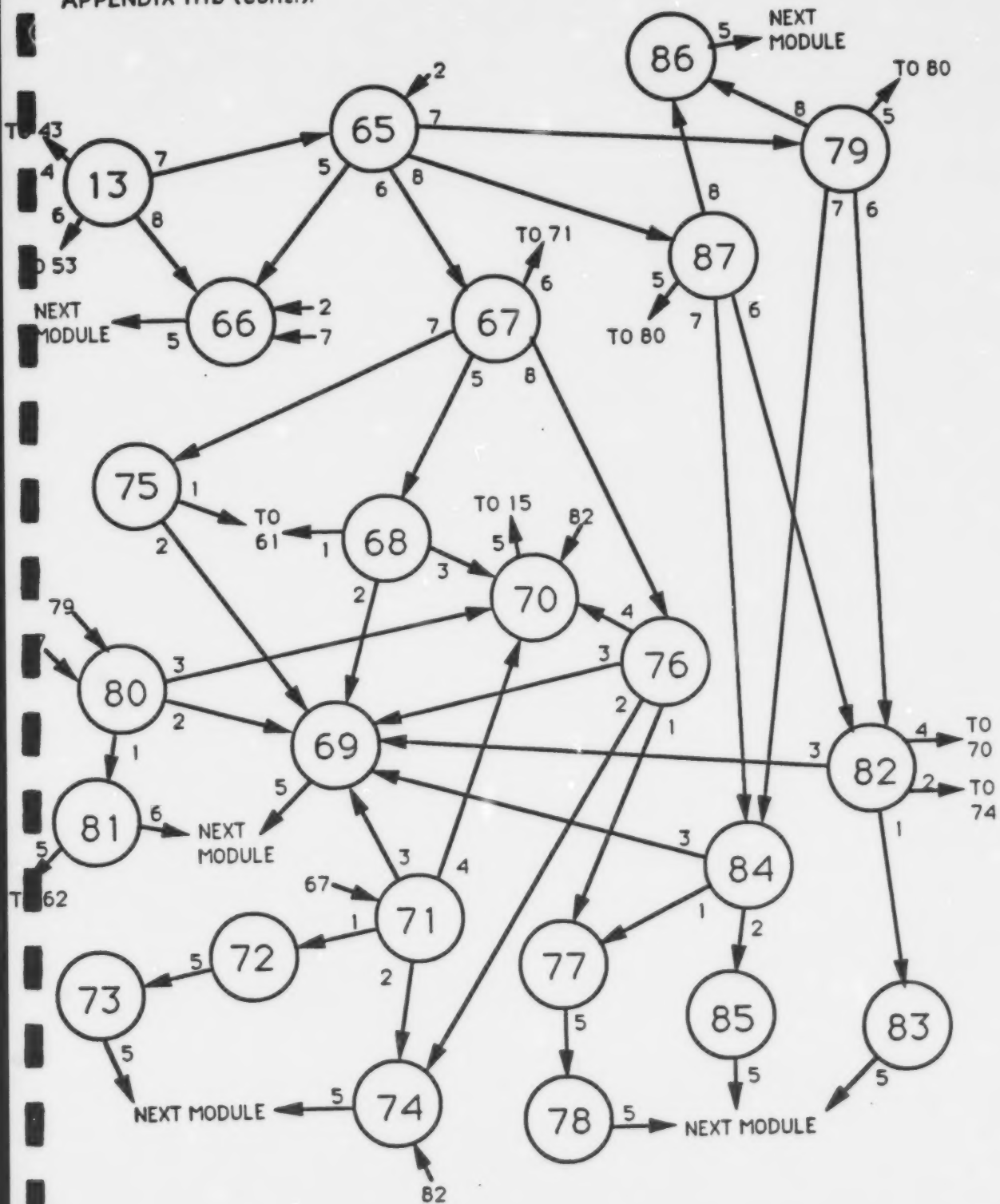
APPENDIX IIIa: PASSENGER LANGUAGE SELECTION



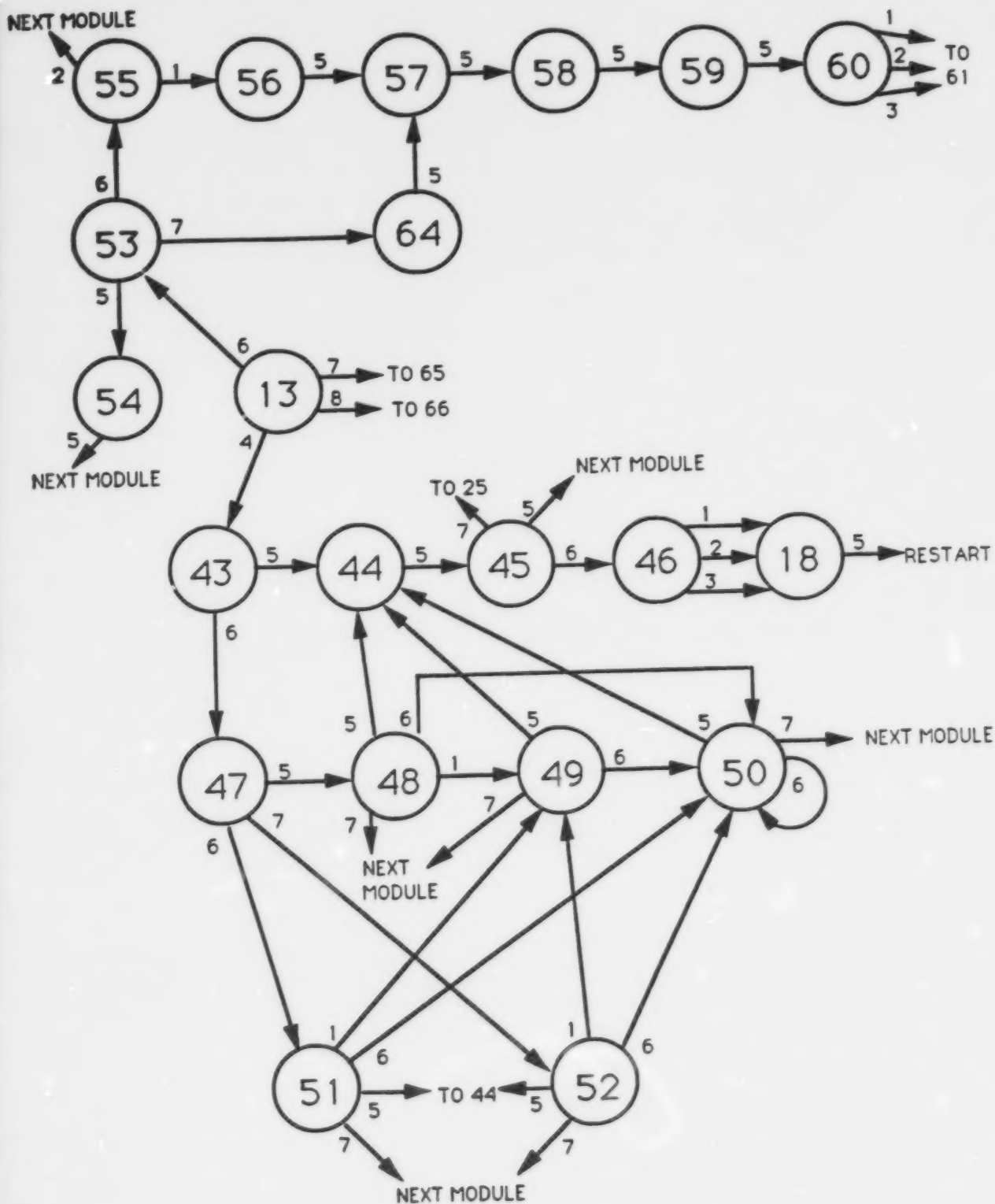
APPENDIX 111b: TICKET AND FLIGHT ARRANGEMENTS

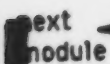


APPENDIX IIIb (cont.):



APPENDIX 111b (cont.):



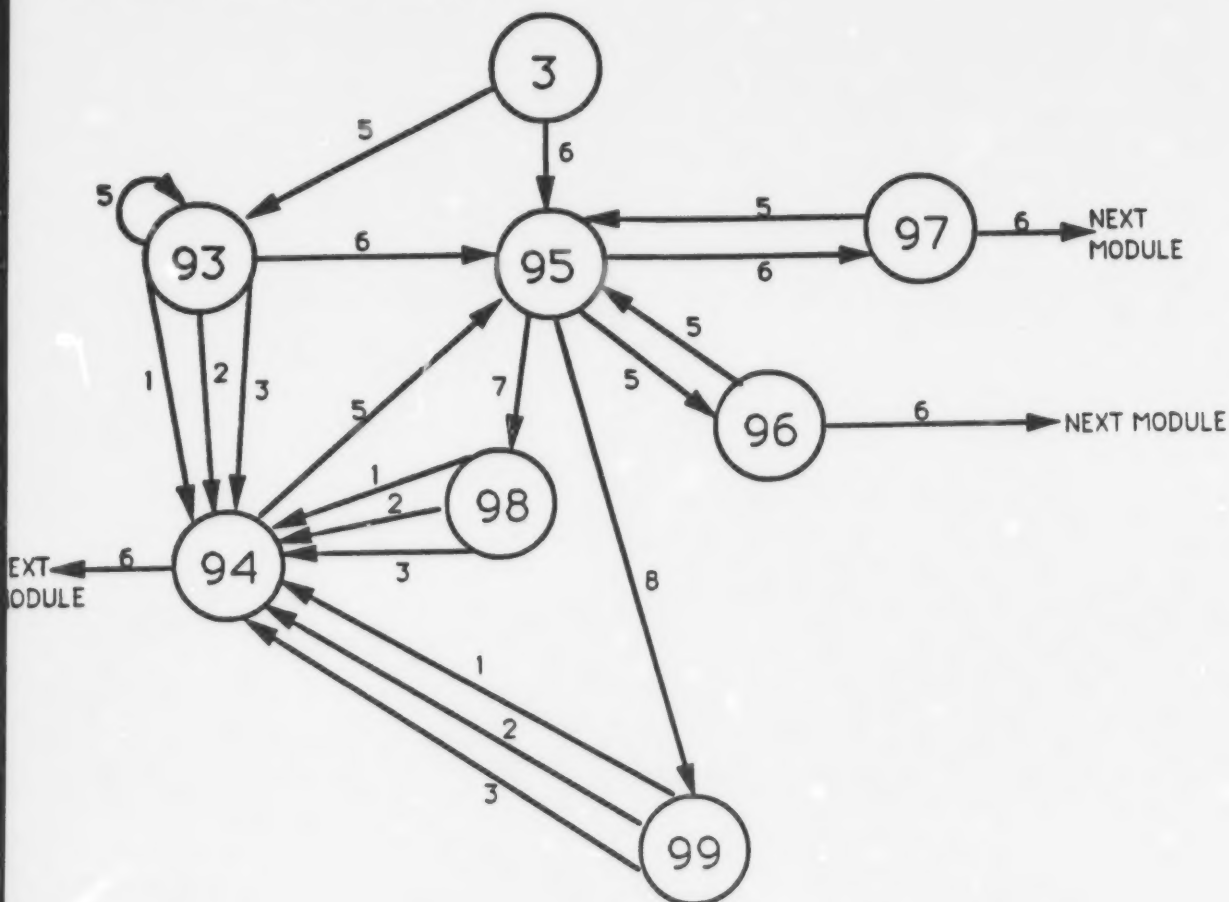


1

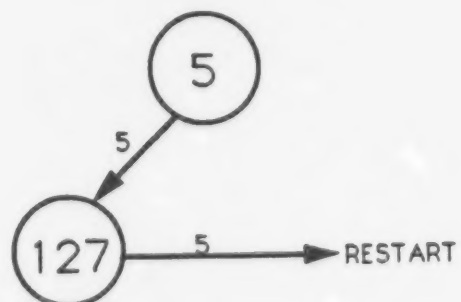


NEXT MODULE

APPENDIX IIIf: BAGGAGE REQUEST



APPENDIX IIIg: BOARDING PASS



APPENDIX IV

PHRASE FILES

Appendix IVa: English

Appendix IVb: French

Appendix IVc: Spanish

Appendix IVd: Chinese

PHRASE FILES.

a. ENGLISH

0 I am processing your flight information and will be with you as soon \
as possible.
1 Thank you. Please wait. I'm working on your flight arrangements.
2 You have requested a /further/ _B_ on _A_.
3 If _A_ is your choice, touch
4 If _B_ is your choice, touch
5 If you speak English, press --->
6 Si vous parlez Franc,ais, appuyez --->
7 Si habla espan-ol, toque --->
8 @0021@0022@0004@0029@0030@0031, @0026@0016@0017--->
9 Request ticket
10 Problem with ticket
11 Problem with flight
12 Too early for check-in
13 Hello. I will help you with your flight.
14 Please present your ticket. If no ticket, please select:
15 I want to purchase a ticket.
16 My flight is pre-booked. I wish to pay now.
17 My ticket is pre-paid.
18 I have lost my ticket.
19 What is your destination?
20 What is your destination? Please touch the city.
21 Leave when?
22 When do you want to go? Please touch a date.
23 Offer Flight
24 The cost of the ticket is \$__. Please tell me |how you want to pay.
25 Cash
26 Credit card
27 Cheque
28 I will pay cash.
29 I will pay by credit card.
30 I will pay by cheque.
31 Continue with check-in
32 Arrange payment
33 Request identification
34 What is your departure date? Please touch a date.
35 No reservation found
36 I can not find a reservation in your name. Would you like to purchase \
a ticket?
37 Yes
38 No
39 Yes, I would like to purchase a ticket.
40 No, I do not want to purchase a ticket.
41 Terminate session
42 Request passport
43 Request visa
44 Please show me your identification. If you do not have any, select:
45 I have no identification.
46 Request further identification
47 I require adequate identification to book a flight. Please supply a \
passport, visa, or other identification.
48 Please show me your passport. If you do not have one, select:
49 I have no passport.
50 Please show me your visa. If you do not have one, select:
51 I have no visa.
52 Reservation found

56 Ticket not for AC flight
 57 Ticket not for today
 58 Ticket error
 59 Your ticket is not for an Air Canada flight. An agent will direct you \
 to the proper ticket counter.
 60 Your ticket is not for a flight that leaves today. Please select:
 61 I want to change my ticket.
 62 I will return on the correct date.
 63 Check-in later today.
 64 You are too early for check-in. Please come back |at __ hours.
 65 Your ticket is not for a flight that leaves today. Please return on \
 the day of departure.
 66 There is an error on your ticket and it must reissued.
 67 Please wait. I am making your flight arrangements and will be with you \
 as soon as possible.
 68 Too early for check-in
 69 Flight delayed
 70 Flight cancelled
 71 Flight missed
 72 You are too early for check-in. Please come |back at _A_ hours.
 73 Your flight has been delayed.
 74 Please wait while I make other arrangements for you.
 75 Known departure time, today
 76 Known departure time, arrange hotel
 77 Unknown departure time, today
 78 Unknown departure time, arrange hotel
 79 The new departure time |is _A_ hours. Please select:
 80 I will take the later flight.
 81 I would like a refund.
 82 I would prefer to arrange another flight.
 83 The refund for your ticket will be mailed to your home address.
 84 Our policy is to have you purchase a new ticket. You will be \
 reimbursed for the old ticket.
 85 The new departure time is _A_ hours tomorrow. |Hotel accomodation _T_ \
 is available. Please select:
 86 I will go to the hotel.
 87 I will make my own hotel arrangements.
 88 I would like hotel accomodation.
 89 Offer hotel
 90 You will be staying at the _H_. Please wait. I will call an agent to \
 help you.
 91 The new departure time will be displayed on the Air Canada monitor \
 shortly. Please select:
 92 Hotel accommodation is available. I will contact your hotel as soon as \
 I have a new departure time. Please select:
 93 You will be staying at the _H_ _T_. Please wait. I will call an agent \
 to help you.
 94 Your flight has been cancelled.
 95 Alternate flight today
 96 Alternate flight later, arrange hotel
 97 Alternate flight time unknown
 98 Bus transportation arranged
 99 An alternate flight flight leaves |at _A_ hours. Please select:
 100 I will take the alternate flight.
 101 An alternate flight leaves at _A_ hours tomorrow. |Hotel accomodation \
 is available _T_. Please select:
 102 Arrangements are being made for an alternate flight. Please select:
 103 I will wait for the next available flight.
 104 Air Canada has arranged bus transportation to your destination, \
 leaving from the airport at __ hours.
 105 Your have missed your flight.
 106 Request baggage

111 I would like to carry some baggage.
112 I have no baggage.
113 Carry-on baggage too large
114 Only one piece of carry-on baggage
115 Charge for excess baggage weight
116 Charge for excess baggage size
117 Your carry-on baggage is too large. Please place it on the scale.
118 Your are permitted only one piece of carry-on baggage. Please place \
the rest on the scale.
119 Your baggage is over the allowed weight. |I must charge you an extra \
\$. Please indicate how you will pay:
120 Your baggage is over the allowed size. |I must charge you an extra \
\$. Please indicate how you will pay:
121 Yes
122 No
#121 No business
#122 (null)
123 Arrange special seating
124 Arrange seating
125 Seating is satisfactory
126 Seating is not satisfactory
127 Arrange boarding pass
128 The gate number and departure time are on your boarding pass. Please \
be at the gate 30 minutes before departure.
129 For general information about the airport, please go to the \
information centre.

b. FRENCH

- 0 Je suis en train de ve'rifier votre vcl, et je serai a' votre disposition auss
- 1 Merci. Attendez s.v.p. Je prends des dispositions pour votre vol.
- 3 Si votre destination est A, appuyez
- 4 Si votre date de de'part est B, appuyez
- 5 If you speak English, press --->
- 6 Si vous parlez Franc,ais, appuyez --->
- 7 Si habla espan-ol, toque --->
- 8 @0021@0022@0004@0029@0030@0031, @0026@0016@0017---->
- 9 Demander billet
- 10 Proble'me de billet
- 11 Proble'me de vol
- 12 Trop to't pour enregistrement
- 13 J'aimerais vous aider a' organiser votre vol.
- 14 Puis-je voir votre billet, s.v.p. Si vous n'en avez pas, choisissez:
- 15 J'aimerais acheter un billet.
- 16 J'ai de'ja' re'serve' mon vol; j'aimerais le payer maintenant.
- 17 Mon billet est de'ja' paye'.
- 18 J'ai perdu mon billet.
- 19 Quelle est votre destination?
- 20 Quelle est votre destination? Indiquer la ville en appuyant, s.v.p.
- 21 Quand voulez-vous partir?
- 22 Quand voulez-vous partir? Indiquer la date en appuyant, s.v.p.
- 23 Sugge'rer un vol
- 24 Le prix du billet sera \$__. Comment aimeriez-vous payer?
- 25 Argent comptant
- 26 Carte de cre'dit
- 27 Che'que
- 28 Je payerai en argent comptant. .
- 29 Je payerai par carte de cre'dit.
- 30 Je payerai par che'que.
- 31 Continuer l'enregistrement
- 32 Comment payer?
- 33 Demander identification
- 35 Re'servation introuvable
- 36 Je ne trouve pas de re'servation a' votre nom. Aimeriez-vous acheter un bill
- 37 Oui
- 38 Non
- 39 Oui, j'aimerais acheter un billet.
- 40 Non, je ne veux pas acheter un billet.
- 41 Terminer session
- 42 Demander passeport
- 43 Demander visa
- 44 Puis-je voir votre pie'ce d'identite', s.v.p. Si vous n'en avez pas choisisse
- 45 Je n'ai pas de pie'ce d'identite'.
- 46 Demander encore identification.
- 47 J'ai besoin d'un pie'ce d'identite' suffisante pour re'server un vol. Puis-je
- 48 Puis-je voir votre passeport, s.v.p. Si vous n'en avez pas, choisissez:
- 49 Je n'ai pas de passeport.
- 50 Montrez-moi votre visa, s.v.p. Si vous n'en avez pas, choisissez:
- 51 Je n'ai pas de visa.
- 52 Re'servation trouve'e
- 53 Notre politique est de vous demander d'acheter un nouveau billet; \
- le prix du billet perdu vous sera rembourse'.
- 54 Re'servation paye'e.
- 55 Re'servation n'est pas paye'e.
- 56 Billet n'est pas pour AC.
- 57 Billet n'est pas pour aujourd'hui.
- 58 Erreur de billet.

62 Je reviendrai le jour du vol.
63 Enregistrement plus tard aujourd'hui
64 Vous êtes trop tôt pour vous enregistrer. Revenez à' _ heures, s.v.p.
65 Votre billet n'est pas pour un vol d'aujourd'hui. Revenez le jour du de'part
66 Il y a un erreur sur votre billet et il faut le refaire.
67 Un instant, s.v.p. Je suis en train de ve'rifier votre vol et je serai a' vot
68 Trop tôt pour enregistrement
69 Vol retarde'
70 Vol supprime'
71 Vol manque'
72 Vous êtes trop tôt pour vous enregistrer. Revenez à' _A_ heures, s.v.p.
73 Votre vol est retarde'.
74 Attendez pendant que je prends les dispositions ne'cessaires s.v.p.
75 Heure de de'part connue, aujourd'hui
76 Heure de de'part connue, re'server un ho'tel
77 Heure de de'part inconnue, aujourd'hui
78 Heure de de'part inconnue, re'server un ho'tel
79 Le de'part a e'te' remis a' _A_ heures. S.v.p choisissez:
80 Je prendrai le vol a' l'heure indique'e.
81 J'aimerais e'tre rembours'e.
82 Je pre'fe'rerais un autre vol.
83 Le remboursement vous sera envoye' par la poste.
84 Notre politique est de vous demander d'acheter un nouveau billet. Le prix de
85 Le de'part a e'te' remis a' _A_ heures demain. Une chambre d'ho'tel vous est
86 J'irai a' l'ho'tel sugge're'.
87 Je prendrai mes propres arrangements pour le logement.
88 J'aimerais avoir une chambre d'ho'tel.
89 Sugge'rer un ho'tel
90 Vous irez a' l'ho'tel _H_. Attendez, s.v.p. J'appellerai un agent pour vous ai
91 Les tableaux d'affichage d'Air Canada montreront biento't la nouvelle heure d
92 Une chambre d'ho'tel vous est re'serve'. De's que la nouvelle heure de de'par
93 Vous irez a' l'ho'tel _H_ _T_. Attendez s.v.p. J'appellerai un agent pour vous
94 Votre vol a e'te' supprime'.
95 Autre vol aujourd'hui
96 Autre vol plus tard, re'server un ho'tel.
97 Autre vol, heure de de'part inconnue.
98 Transport terrestre arrange'
99 Il y aura un autre vol a' _A_ heures. S.v.p. choisissez:
100 Je prendrai le vol sugge're'.
101 Il y aura un autre vol a' _A_ heures demain. Une chambre d'ho'tel vous est r
102 Nous prenons les dispositions ne'cessaires pour vous trouver un autre vol.
103 J'attendrai le prochain vol disponible.
104 Air Canada a nolise' un autobus pour votre destination; l'autobus partira de
105 Votre vol est de'ja' parti.
106 Demander les bagages
107 Proble'me de bagages
108 Placez vos bagages sur le plateau, s.v.p.
109 Si ne'cessaire, indiquer:
110 C'est tout, je n'ai plus de bagages.
111 J'aimerais emporter quelque chose avec moi.
112 Je n'ai pas de bagages.
113 Bagages de cabine trop grand.
114 Une seule valise
115 Frais: exce'dent de poids
116 Frais: bagage trop grand
117 Votre bagage de cabine est trop grand. Placez-le sur le plateau, s.v.p.
118 Vous pouvez emporter une seule valise. Placez les autres sur le plateau, s.v
119 Vous avez un exce'dent de poids. Je dois vous demander de payer un supple'm
120 Votre bagage est trop grand. Je dois vous demander de payer un supple'ment d
121 Oui
122 Non
123 Besoins particuliers de sie'ge

128 La salle et l'heure de de'part sont indique'es sur votre carte d'acce's a' b
129 Pour des renseignements ge'ne'raux sur l'ae'roport, veuillez passer au centr

c. SPANISH

0 Estoy procesando la informacio'n de su vuelo. Estare' con usted lo ma's pron
1 Gracias. Un momento, por favor. Estoy arreglando su vuelo.
3 Si A es su seleccio'n, toque.
4 Si B es su seleccio'n, toque.
5 If you speak English, press --->
6 Si vous parlez Franc,ais, appuyez --->
7 Si habla espan-ol, toque --->
8 @0021@0022@0004@0029@0030@0031, @0026@0016@0017--->
13 Le ayudare' con su vuelo.
14 Por favor, presente su billete. Si no tiene billete, seleccione por favor:
15 Quiero comprar un pasaje.
16 Mi vuelo esta' reservado. Deseo pagarlo ahora.
17 Mi pasaje esta' pagado.
18 Se me ha perdido el billete.
20 ?^Cua'l es su destino? Por favor, toque la ciudad.
22 ?^Cua'ndo desea Ud. viajar? Por favor, toque la fecha.
24 El precio del pasaje es \$__. Di'game, por favor, como desea pagarlo.
25 Efectivo
26 Tarjeta de cre'dito
27 Cheque
28 Pagare' en efectivo
29 Pagare' con tarjeta de cre'dito.
30 Pagare' con cheque.
36 No puedo encontrar ninguna reservacio'n en su nombre. ?^Desea Ud. comprar un
37 Si'
38 No
39 Si', deseo comprar un pasaje.
40 No, no deseo comprar un pasaje.
44 Por favor, mue'streme su identificacio'n. Si no tiene ninguna, seleccione:
45 No tengo ninguna identificacio'n.
47 Necesito identificacio'n satisfactoria para hacer la reservacio'n. Por favor
48 Por favor, mue'streme su pasaporte. Si no tiene ninguno, seleccione:
49 No tengo pasaporte.
50 Por favor, nue'streme su visa. Si no tiene ninguna, seleccione:
51 No tengo visa.
53 Nuestra regulacio'n es que Ud. compre un pasaje nuevo. El precio del pasaje
59 Su pasaje no es para Air Canada. Un agente lo dirigira' a la li'nea correspo
60 Su pasaje no es para un vuelo de hoy. Por favor, seleccione:
61 Quiero cambiar el pasaje.
62 Volvere' en el di'a correcto.
64 Es demasiado temprano para registrarlo. Por favor, vuelva a:_____
65 Su pasaje no es para un vuelo de hoy. Por favor, vuelva al di'a del vuelo.
66 Hay en errore en su pasaje y debe ser reemitido.
67 Un momento, por favor. Estoy arreglando su vuelo y estare' con Ud. lo ma's p
72 Es demasiado temprano para registrarlo. Por favor, vuelva a: A
73 Su vuelo esta' astrasado.
74 Espe'reme, por favor, mientras hago otros arreglos para Ud.
79 La nueva hora de salida es: A. Por favor, seleccione:
80 Tomare' el vuelo de ma's tarde.
81 Quisiera un reembolso.
82 Preferiri'a ordenar otro vuelo.
83 El reembolso de su pasaje sera' mandado por correspondencia a su direccio'n.
84 Nuestra regulacio'n es que Ud. compre un pasaje nuevo. Ud. sera' reembolsado
85 La nueva hora de salida es man-ana: A. El alojamiento del hotel esta' dispo
86 Ire' al hotel.
87 Hare' mi propia reservacio'n de hotel.
88 Quisiera una reservacio'n de hotel.
90 Se quedara' en este hotel: H. Por favor, espere. Llamare' a un agente para

99 Un vuelo alterno sale a: A. Por favor, seleccione:
100 Tomare' el vuelo alterno.
101 Un vuelo alterno sale man-ana a: A. El alojamiento del hotel esta' disponi
102 Se hacen los arreglos necesarios para un vuelo alterno. Por favor, seleccio
103 Esperare' el pro'ximo vuelo disponible.
104 Air Canada ha arreglado el traslado por autobus a su destino, saliendo del a
105 Ha perdido su vuelo.
108 Por favor, ponga su equipage en la ba'scula.
109 Si es necesario, seleccione:
110 Eso es todo el equipaje.
111 Me gustari'a llevar conmigo algo de equipaje.
112 No tengo equipage.
117 El equipage que quiere llevar con Ud. es demasiado grande. Por favor, po'ng
118 A Ud. le esta' permitido llevar so'lo un bulto en el avio'n. Por favor, pon
119 Ud. tiene sobrepeso de equipaje. Se le cobrara' \$___ de ma's. Por favor, i
120 Su equipaje esta' sobre el taman-o permitido. Se le cobrara' \$___ de ma's.
121 Si'
122 No
125 El asiento es satisfactorio.
126 El asiento no es satisfactorio.
128 El nu'mero de la puerta y hora de salida esta'n en su billete de abordo. Po
129 Para averiguar ma's acerca del aeropuerto, por favor vaya al centro de infor

d. CHINESE

0. 我在处理您的登机信息。请稍等片刻。
1. 谢谢您。请稍等一下。我正在安排您的登机。
3. 如果_____是您的选择。请按一下此键。
4. 如果_____是您的选择。请按一下此键。
8. 如果您讲中文。按一下--->
13. 您好。我将帮您安排登机。
14. 请您出示机票。如果您没有机票，请选择：
15. 我想买一张飞机票。
16. 我的登机是预定好的。我想现在付款。
17. 我的飞机票已预先付好款了。
18. 我丢失了我的飞机票。
20. 您的目的地是什么地方？请按一下该城市名。
22. 您什么时候动身？请按一下该日期。
24. 该飞机票价格为：_____。请告诉我您的付款方式。
25. 现金。
26. 信用卡。
27. 支票。
28. 我付现金。
29. 我用信用卡付款。
30. 我用支票付款。
34. 您的出发日期为何时？请按一下该日。
36. 我在预定单上找不到您的名字。
您想不想买一张飞机票？
37. 想买。
38. 不想买。
39. 是的。我想买一张飞机票。
40. 不。我不愿买飞机票。
44. 请向我出示您的身份证。如果您没有身份证，
请选择：
45. 我没有身份证。
47. 我需要看一下您的有效的身份证才可为您
预定登机。请出示您的护照，
签证，或其他证件。
48. 请让我看一下您的护照。如果您没有护照，
请选择：
49. 我没有护照。
50. 请让我看一下您的签证。如果您没有签证，
请选择：
51. 我没有签证。
53. 我们的政策是由您再重新买一张机票。
您将得到您丢失的机票的退款。
请让我看一下您的身份证。

如果您没有身份证。 请遵循：

59. 您的飞机票不是乘加拿大航空公司飞机的。
将有一位工作人员帮助您找到您应该去的服务台。

60. 您的飞机票不是今天的。 请选择:
61. 我想更换机票。
62. 我按机票所定起飞日期再来。
64. 您现在办理登机手续还太早。 请在____时再来。
65. 您的飞机票不是今天的。 请按机票上的日期再来。
66. 您的飞机票上有一个错误。 您必须更换一张机票。
67. 请等一下。我在安排您的登机,很快搞完。
72. 您现在办理登机手续还太早。请在____时再来。
73. 您的登机晚点了。
74. 请等一下, 我替您作其他的安排。
79. 新的起飞时间是____时。 请选择:
80. 我想乘下一班飞机。
81. 我想退票。
82. 我想再安排另一班机。
83. 您的飞机票的退款将寄到您的家庭住址。
84. 我们的政策是由您再重新买一张机票。
您将得到您原来机票的退款。
85. 新的起飞时间是明天____时。这里安排有旅馆。
请选择:
86. 我去你们安排的旅馆。
87. 我自己安排旅馆。
88. 我想住旅馆。
90. 您将住在____旅馆。 请等一下。我叫一位工作人员帮助您。
91. 新的起飞时间不久将显示在加拿大航空公司的显示屏上。
请选择:
92. 这里安排有旅馆。
我一得到新的起飞时间就跟您的旅馆联系。
请选择:
93. 住旅馆的费用将由 您自己____ 我们____ 支出。
我将叫一位工作人员帮助您。
94. 您的登机被取消了。
99. 另一班机将在____时起飞。请选择:
100. 我想换另一班机。
101. 另一班机于明天____时起飞。这里安排有____旅馆。
请选择:
102. 另一班机已经安排好了。 请选择:
103. 我想下一班机。
104. 加拿大航空公司已经安排了巴士送您去您的目的地。
这辆巴士于____时由机场出发。
105. 您已误了您的登机。
108. 请把您的行李放在磅台上。
109. 如果有必要, 请选择:

- 110。这是我的全部行李。
- 111。我想自己携带一些行李。
- 112。我没有行李。

117. 您的随身携带行李太大。 请把它放在靠台上。
118. 您只允许随身携带一件行李登机。 请将其余的行李放在靠台上。
119. 您的行李超重了。我必须再加收您 \$_____。
- 请说明您的付款方式:
120. 您的行李体积超过标准。我必须再加收您 \$_____。
- 请说明您的付款方式:
125. 我对座位满意。
126. 我对座位不满意。
128. 登机门号和起飞时间在登机卡上。
- 请於起飞时间以前三十分鐘以上在登机门前等候登机。
129. 如果您想询问有关飞机场的一般情况, 请到问询处。

APPENDIX C
ERGONOMIC EVALUATION





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**AN ERGONOMIC FIELD EVALUATION OF TRANSLAID: A
TRANSPORTATION TERMINAL CHECK-IN DEVICE FOR
TRAVELLERS WITH HEARING, SPEECH, OR LANGUAGE
DIFFICULTIES**

Prepared for
RUTENBERG DESIGN INC.
and
TRANSPORT DEVELOPMENT CENTER

Prepared by
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AN ERGONOMIC FIELD EVALUATION OF TRANSLAID: A TRANSPORTATION TERMINAL CHECK-IN DEVICE FOR TRAVELLERS WITH HEARING, SPEECH, OR LANGUAGE DIFFICULTIES

1.0 INTRODUCTION

Ergo Systems Canada Inc., an ergonomics consulting company specializing in human factors evaluation, research and training, was contracted by Rutenberg Design Inc. to evaluate the usability, in the field, of Translaid a computer-aided communication device for travellers with language, hearing, or speech difficulties.

This report describes the usability of Translaid in the field, the results and difficulties encountered, and a list of recommendations to further enhance the usability of Translaid prior to marketing the product.

1.1 Background to the Study

The ability for travellers to communicate in person with transportation personnel/travel agents is an essential element of all transportation modes. In recent years, transportation companies have been improving the provision of goods and services to customers who are disabled in our society, especially those with hearing disabilities.

One of Canada's major industries is tourism. However, a major difficulty encountered by many foreign travellers to Canada is that they do not speak either English or French. Often non-English speaking travellers are confused and frustrated by their inability to communicate. There are several ways to overcome these communication difficulties including being accompanied by a travel companion that speaks English or French (but this is not always possible), having translators on call at the airport (but this can be very costly

and the translator with the right skills may not always be available), or to utilize today's technology .

In 1987 the concept for Translaid was proposed. In 1988 it was designed by Rutenberg Design and developed by TDC. Translaid is a computer-aided communication device designed to be used by an airline agent and a travelling passenger to overcome language, hearing and speech difficulties during check-in at an airport.

In 1988/89 Dr. Ruth Heron reviewed screen by screen the ergonomic qualities and deficiencies of the first prototype of Translaid. Subsequently some modifications were completed. As a follow-up to Dr. Heron's work this study was initiated to assess the usability of Translaid in-the-field by airline passenger agents and travellers.

1.2 Scope and Objectives

The specific project objective is to improve the usability of Translaid by travellers and agents through an assessment of its effectiveness for defined market segments.

The overall project objective is to improve the accessibility to air and rail transportation systems, by all segments of the travelling public, and more specifically by persons who do not speak English or have a hearing and/or speaking disability.

The project requirements entailed the following tasks:

- Development of a research protocol involving simulations;
- Assessment of current Translaid capabilities using subjects from defined market segments;
- Defining and clarifying the problems and deficiencies, if any, identified and to suggest possible opportunities for improvements.

2.0 EVALUATION

In order to build on the research carried out earlier (Heron, et.al., 1989), the same equipment was used, the Translaid machine, and a similar research protocol was developed.

First an in-house evaluation was carried out by two experienced travellers mapping all nodes and identifying any missing information links in the system. The in-house evaluation was followed by field trials.

The field trials were conducted at the Vancouver International Airport. However, due to counter constraints the field trials were conducted in a conference room. One individual with a hearing disability (completely deaf) and fluent in English, and three individuals fluent in either French, Spanish, or Chinese were identified in the Vancouver community and acted as travelling passengers. Subject characteristics are described in Table 1. In addition, four passenger agents (two from Air Canada and two from Canadian Airlines) volunteered to act as passenger agents during the simulations. Two of the agents evaluated the passenger agent screens in French while the other two agents evaluated the passenger screens in English. The passenger agents had 5 - 20 years experience in the industry and ranged in age from 38 - 55.

Table 1.

Subject Characteristics
Passengers

<i>Mother Tongue</i>	<i>Sex</i>	<i>Age</i>	<i>Travel Experience</i>	<i>Occupation</i>	<i>Yrs. in Canada</i>
Deaf	F	34	once per year	Homemaker	34 yrs.
Cantonese	F	31	once per year	Clerk Typist	1 yr.
Spanish	F	32	2-3 per year	Actor	12 yrs.
French	M	38	once per month	Sales agent	38 yrs.

Each team of passenger and agent were asked to complete at least the following four scenarios:

1. Passenger: Needs to purchase a ticket to Montreal, for today, and to request an aisle seat.

Agent: During check-in agent identifies a problem with the passenger's carry on luggage (it is too big, or too heavy).

2. Passenger: Wants to check-in for a flight.

Agent: Flight has been cancelled, bus transportation has been arranged.

3. Passenger: Transit passenger missed flight wants to get next flight.

Agent: No other flight available till tomorrow, offers to make hotel arrangements (at airline expense/at passenger expense).

4. Passenger: Has ticket but wants to change flights to an earlier flight.

Agent: Notices passenger has little toddler.

Subjects and agents were asked to comment on each new screen as it appeared during a scenario. Subjects and agents were asked to express any difficulties they experienced with screen comprehension, readability, appropriateness of expressions (grammar/choice of words), available choices, required actions, and sequence of screens.

After completing all scenarios a passenger and agent team was asked to verbally respond to 25 system specific questions.

3.0 RESULTS & DISCUSSION

To simplify the presentation of the results, the results are organized in such a manner that the comments start with the physical characteristics of the system, followed by general comments about the overall system, to scenario and screen specific comments, and finally the responses to the 25 structured questions.

Prior to reporting the results it is necessary to inform the reader that it is always a lot easier to critique a product than to actually come up with an initial design. In light of this fact it is essential to say at this point that the Translaid machine, as a concept, received favorable reviews, both from the travellers and the airline agents. However, as a product numerous refinements are necessary to the existing prototype to ensure long-term acceptability by the airlines and usability by the traveller.

3.1 Physical Appearance

Comments: Early on in the design of Translaid it is necessary to determine how the machine will be marketed to the airlines. In terms of marketing, one important question to ask is whether the designer envisions a Translaid machine at each airline counter or only at one special counter for passengers seeking assistance. If the designer sees a need for the Translaid machine at each counter (or one shared between two agents) then one of the biggest challenges facing the designer will be devising a method so that the machine is adaptable to different counters. For instance, where there is no passenger interaction the new Air Canada counters in Vancouver have an inverted-V counter top finish. As a result it was not possible to set-up the Translaid machine (which requires an 20cm - max. 30cm flat surface) in the new counters. Similar problems will be encountered more frequently as new terminals with new innovative counter designs are built across the country. Another important aspect of marketing the machine will be identifying how passengers with language difficulties or hearing and speech disabilities will be

directed to the right area where the machine(s) is located and encouraged to use it.

Recommendation: No specific comments were made by any of the officials of the airlines who saw the evaluations take place. However, some viewers thought that most probably Translaid would be set-up in a special booth which would make it easier to direct travellers in need of an interpreter. Initially this is what may actually happen because of the limited space available at a counter, at least, until wider acceptance of Translaid has been achieved at which point it would be most advantageous to integrate the system directly into the ticket counter.

Comments: Depending on the location of the screen both passengers and agents had difficulty reading the screen because of the glare created by the overhead lights on the horizontally positioned screens. Furthermore, it was observed that several times during the trials passengers would start to lean on the screen edge as they contemplated their options and read the messages. In the long-term this may damage the screen and wire connection components.

Recommendation: It is strongly recommended that the screens be tilted at an angle, possibly 45° or be adjustable. If the screen needs to be 'fixed' at a specific angle, then different angles should be evaluated to minimize glare and to ensure legibility. A vertical angle should be avoided as it will limit the viewing ability of taller travellers.

Comments: In terms of physical appearance a number of agents and passengers commented on the cold-blue look of the machine. They felt it looked too much like a video machine, somewhat intimidating for someone not familiar with computers.

Recommendation: No alternative design was suggested by the participants, however, it may helpful in future designs to use something familiar to most people like a 'book' design to counter any negative reactions associated with computers.

Comments: Lastly, the agents felt that the light button (to signal the agent that the passenger wanted to use the machine) did not remain 'on' long enough for the agent to observe the light while engaged in other activities.

Recommendation: Either to have a light switch that stays on until the dialogue is initiated; or to consider an auditory signal; or to consider both an auditory and visual signal thereby introducing redundancy but also ensuring a greater probability that the agent will identify the need for the use of the machine.

3.2 Global Comments About the System

Both passengers and agents felt that the Translaid system could contribute to the well-being of the travelling passenger and enhance the airline's image of truly caring about their customers. The agents felt that they needed only a little bit off training on the machine to understand the mode and nodule concept, however, in general it was considered to be very simple to operate. They felt that it was efficient, and that it could really help with customer service/communications, because so often in the past they have felt helpless trying to understand non-speaking English travellers. Both passengers and agents liked the layout of the screen, however, numerous problems were identified with the existing prototype of Translaid that need to be corrected before the product becomes viable on a national and international market.

Passenger Comments:

- The Chinese dialogue is very verbose and extremely polite.
- The Spanish dialogue is stilted and has used literal translations in some cases. The tense in which the passenger is addressed in the dialogue is not consistent. At times the dialogue is presented in the formal tense at other times it is not.
- The French dialogue has some grammatical problems.

- The English dialogue needs to be simplified (e.g. instead of using the word 'confirm' use 'yes/no') and somewhat enlarged if it is to be used by persons with a hearing disability as they may also have a visual disability or a comprehension problem.
- Initially, when passengers were asked to press the button to initiate the dialogue, a number of passengers did not realize that the button was the square on the screen and were actually looking for a button.
- The screen button did not always respond. It was not clear to the passenger how hard or soft to press.
- The message from the agent should be highlighted to draw attention to it, or to those parts of the screen that have changed (persons with hearing disabilities need visual feedback).
- On occasion the agent changed the information on the screen before the passenger had time to read the entire message. The passenger should have an ACKNOWLEDGE button before the agent can transmit the next screen of information.
- The SEND button should be highlighted or flash, because sometimes when the passenger made a choice they did not realize they also had to press the SEND button.
- Generally the passengers felt they had no control over the screens or the actions of the agent. They could not back up or indicate that they wanted to make a change part way through the dialogue, and at times the screen was replaced by the agent with a new screen before they finished reading it.
- A pictogram keyboard may be useful to select options not available on the screen, or alternatively have additional screens if a passengers problem is

not on the first screen which has the most common problems agents/passengers encounter (e.g. '?' for 'why' as a pictogram).

Agent Comments:

- In the dialogue there is not enough emphasis on customer service (e.g. instead of saying 'the flight has been delayed by 2 hours' the airlines would prefer to say something along the lines of 'we apologize but there has been a delay in the flight', to explain 'why, what options the passenger has etc.:'; in addition to such messages as 'how can I help you' or 'is there anything else I can help you with?').
- The program is inconsistent in terms of when the SEND button needs to be pressed. On some screens once a choice has been made it is automatically sent to the passenger at other times it also needs the send button to transmit the information. This inconsistency should either be eliminated or the SEND button should flash if it needs to be activated after a choice has been made.
- Similarly with the numeric key pad first the enter key should flash followed by the SEND button. It is not intuitive that the enter button needs to be triggered.
- The agent needs to be aware that it takes a lot longer for the Chinese characters to be generated as a result it takes the traveller longer to decipher the message. The agent should have feedback about when the transmission has been completed (in any language) in order to give the passenger enough time to read the information, and to ensure that the message has actually been sent. Or, alternatively, the passenger should have an ACKNOWLEDGE button which must be activated before the agent can send the next message.
- There should be some parallelism between the existing system of checking-in passengers and the Translaid system. For instance once seating

arrangements have been made a boarding pass is generally issued. In the Translaid system the next mode the agent is bumped to after seat selection is baggage. This is not what they are accustomed to.

- The left hand arrow head cursor does not line up with the modes creating confusion.
- There is nothing about return flights which of course would affect the price of the airfare.
- You should eliminate the smoking/no smoking option for Canadian flights because that is not available in Canada.
- If you want high agent acceptance it is critical that before the product is introduced into the workstation that it is totally error free (e.g. when too many flights to Yellowknife were selected there was a system breakdown and the agent had to quit the dialogue).

3.3 Scenario Specific Comments

The most commonly encountered scenarios were used to evaluate the system.

Scenario 1.

Passenger: Needs to purchase a ticket to Montreal, for today, and to request an aisle seat.

Agent: During check-in agent identifies a problem with the passenger's carry on luggage (it is too big, or too heavy need to pay extra).

There were generally no specific problems encountered purchasing a ticket, or obtaining an aisle seat. However, when it came to baggage check-in numerous problems were identified. In the first scenario where the carry on luggage was too big the passenger did not understand why they could not take

their hand luggage on-board (they did not understand that there were size restrictions), the agent could not explain the size restrictions or suggest to the passenger that they take some of their personal belongings out of their bag and to check the rest. There seemed no room for negotiations, the passenger had to do as the agent said or else.

In the second scenario where the passenger was asked to pay for an extra bag once again there was no opportunity for the agent to explain to the passenger that 2 bags were the maximum and that they had to pay for the third, or alternatively that they had to pay for the extra weight. Once again there seemed no room for negotiations, and the passenger had to comply with the agent. Some passengers felt extremely suspicious about the actions of the agent and thought that the agent was cashing the money for himself.

Scenario 2.

Passenger: Wants to check-in for a flight.

Agent: Flight has been cancelled, bus transportation has been arranged.

Once again there was no problem with the attempted check-in, except for the fact that the passenger could not express that they only wanted to check-in. The choices which are presently available on the screen e.g. 'purchase', 'pay', 'pick-up' or 'lost' are not relevant in this instance. The main problem appeared towards the end when the passenger was informed that the flight had been cancelled (but the agent could not explain why which frustrated the passenger) and that bus arrangements had been made (which were unacceptable to the passenger but the passenger could not communicate that through Translaid). Again in this scenario the agent had the final word which is contradictory to the way airlines want to be perceived by the travellers. If the passenger would like to explore alternatives the airlines are only too willing to accommodate. This type of service and flexibility needs to be incorporated into Translaid.

Scenario 3.

Passenger: Transit passenger missed flight wants to get next flight.

Agent: No other flight available till tomorrow, offers to make hotel arrangements (at airline expense/at passenger expense).

Similar to the previous two scenarios the introductory options are not appropriate in this case. When the passenger was informed that there was no flight until tomorrow it was not possible for the passenger to express to the agent the importance of getting to their destination, today, by any other connections or means. When the passenger finally resigned him/herself to a hotel the agent had difficulty selecting the hotel (the Hyatt Regency) at the bottom of the list.

When the scenario was switched to 'hotel at passenger's expense' the passenger wanted to know the various price ranges of the individual hotels, and whether or not they were close to the airport or downtown. Neither could the passenger request this information nor could the agent present it once this communication request had been established.

Scenario 4.

Passenger: Has ticket but wants to change flights to an earlier flight.

Agent: Notices passenger has little toddler.

The passenger arrived early at the airport and therefore wanted to take an earlier flight. In the opening screens there was no way for the passenger to communicate this. Under normal circumstances, if the agent had read the ticket they would say to the passenger 'you are too early for check-in'.

Furthermore the passenger had a toddler with her (in some cases there might be more than just one person to check-in - how does the agent ask 'are you check-in by yourself?') there was no way for the agent to ask any questions about the toddler.

3.4 Questionnaire Discussion Comments

To summarize the experiences of the passengers and the agents at the end of the simulated scenarios each couple was asked 25 specific questions about Translaid.

When using Translaid, did you experience problems with any of the following:

1. Figuring out how to use Translaid?
2. The amount of guidance provided?
3. Screen documentation?
4. Understanding how to carry out the tasks?
5. Knowing what to do next?
6. Understanding how the information on the screen relates to what you are doing?
7. Finding the information you want?
8. Difficulty reading information?
9. Color of the screen?
10. The rigidity, inflexibility of the system?
11. Lack of help feature?
12. Losing track of where you are in the system or what you have done?
13. Having to remember too much information while carrying out the task?
14. System response times (too fast)?
15. Duration of information on the screen?
16. System response times (too slow)?
17. Unexpected actions by the system?
18. An input device which is difficult or awkward to use?
19. Knowing where or how to input information?
20. Having to spend too much time inputting information?
21. Having to be careful in order to avoid errors?
22. Figuring out how to correct errors?
23. Having to spend too much time correcting errors?
24. Having to carry out the same type of activities in different ways?

25. Any other comments?

The full responses are presented in Appendix A.

4.0 CONCLUSION & RECOMMENDATIONS

As is evident from the results all passengers and agents agreed that Translaid could be a very valuable communications tool in the near future. However, all study agents felt that in order to ensure high acceptability by airline agents at large Translaid has to reflect the level of service an agent would offer if they were speaking directly to the passenger.

Similarly, passengers and agents felt that the use of Translaid by passengers will be determined by its physical appearance and what message is conveyed to the passenger to urge them to use the machine. This study had only a small number of subjects, nevertheless 7 out of 8 subjects (passengers and agents) expressed some concern over the color/design of the machine. It may be valuable to conduct a broader survey at this point-in-time to determine what may be a more acceptable color or design.

Even though Dr. Heron's earlier evaluation shed a lot of light on the design and content of the individual screens there are still numerous difficulties encountered with the overall design of the system, and its completeness or lack thereof.

The most common problems reported by the passengers were:

- translation/typing errors,
- their inability to challenge the decisions of the agent,
- their inability to correct an error that had been transmitted instead of cancelled, and
- inconsistencies from screen to screen in terms of which buttons to press.

The most common problems reported by the agents were that:

- the system did not reflect the way they do business (e.g. there are no smoking flights in Canada),
- they could not apologize to the passenger for inconveniencing them, or offer an explanation as to why things were the way they were (e.g. flight delayed), and

- inconsistencies from screen to screen in terms of which buttons to press.

Numerous recommendations are made throughout the report and in the appendices. Despite some of the difficulties that may be encountered in implementing the recommendations it is critical that steps be taken to address, especially, the above described problems. To address the most common problems encountered with the system eight system wide recommendations are made. These recommendations, starting with most important are:

1. To review all foreign language texts for correctness of translation and correcting all errors.
2. To provide more text reflecting airline customer service (e.g. instead of saying 'good-bye' on the final screen replace with 'is there anything else I can help you with?', special meal requests, etc.).
3. To eliminate all obsolete information from the airline files, and to reorganize the information so that it is compatible with other airline procedures. A thorough review needs to be initiated with the airlines.
4. To broaden the scope of available choices to passengers, both in terms of the initial screen (e.g. check-in alone; missed flight etc.) and the ability to question the agents actions (e.g. why is flight cancelled, delayed etc.).
5. To ensure an appropriate level of screen sensitivity (i.e. the agent screen was much more touch sensitive (at times too sensitive) compared to the passenger screen (which was at times totally unresponsive and required several de-presses before accepting selection). In some instances the choices also need to be spaced wider apart (e.g. calendar dates).
6. Provide passenger control of screen changes (i.e. an acknowledge button or proceed button).
7. To have the necessary buttons flash in the order of the sequence that they need to be pressed in order for the information to be transmitted. (e.g. SEND).
8. To provide a back-up button for both the passenger and the agent, i.e. a button to indicate that a made a mistake has been made in the transmission and an alternative decision/option needs to be considered.

APPENDIX - A

When using the system did you experience any of the following problems:

1. Figuring out how to use Translaid?

A.: Minor, the agents are going to need a bit of training.

P.: Generally speaking I think it's very good because it's written right there. I just wait for it to happen.

P.: Some people might have difficulty understanding the characters. In Cantonese when it gets longer and longer the characters are harder to understand. When you keep things short and in everyday Cantonese it is easier. Is this sort of an intellectual Cantonese on the screen now? But, you know for some people, they might not grasp that meaning so quickly, like the elderly.

P.: Maybe need a warning on here about press gently or something after maybe after you've picked the language it should be on, a warning come up in the language to continue press gently, and carefully.

P.: And if there was a demonstration on the screen on how to use the set... where it would flash through a couple of words in their language. Just really simple things....a diagram of a button; press this button for - touch the screen lightly for the response; or as it appears on the screen.

2. The amount of guidance provided?

A.: I would say just minor problems on that as well.

P.: I think there was a problem. Because at the very beginning the first instructions that I get are that this is just to help me get my passing board.

P.: ...the choice of words sometimes was no appropriate. It leaves the passenger up in the air trying to figure out what was actually meant. Two or three times the words were not appropriate.

3. Screen documentation?

A.: I guess what I'm thinking of is that from an agent's point of view after the third, or fourth or fifth time that you use it, your going to almost memorize how it flows from one screen or one option to the next, and how it goes down. For me it would be more the layout and the options available. As far as procedure, well, we sort of get used to everything that we have as it's presented to us. *I would be more inclined over a period of time I think to abbreviate everything for the agent as much as possible so that the screen is not cluttered.* To me what would be most important. *To have the options and very little clutter.* Because over a period of time even though if I were to do it again I've already become familiar with the options and the process. So that will happen quite quickly. That's a totally different ball game on the other side though. They need the detail or at least everything very clearly put out and without too much razzle-dazzle around it. It has to be simple and has to contain all your information recorded.

A.: No. Just a lack of information. There's a lot more that can be programmed into this thing.

A.: Now that we're talking about it, the passenger really does not have enough input. (Not enough control?) Well not over the technical part like how are we going to pay, how are you going to let her know where you want to go; I mean this is all clean cut. You know he doesn't want to go to Toronto, he wants to go to Montreal but as far as service go, he wants all sorts of things. Like you know his baggage, or *maybe he's ordered a special meal like a Moslem meal or Kosher meal or vegetarian like a lot of passengers need. That aspect has not been accounted for.*

P.: As a passenger I felt good. I felt that I was actually getting through to him, except again for the areas that we already talked about, like the beginning.

P.: I think if there might be some error on that machine it could be very confusing. If you had to go back to the beginning that would make people scared ... quite upset. "Oh, I missed it."

A.: When we were trying to discuss what *city she wanted to go to, Gander was not listed.* What I would like to see on there to make it really simple is all the three letter city codes like airlines use so as the table came up for punching numbers into the price box for the ticket and the baggage... you could have the alphabet come up and you press in the three letter code for the city and that would transpose into the language and write it out in full.....Or else give her the alphabet and she could punch in the letters. Otherwise *how do you sort of go through all the cities that we fly to*Right now there's four different screens, so once we put all those destinations in, there'd be ten screens that you'd keep pushing. Or *maybe another screen that would sort of say the city comes between A and C; D and F; you could have the search that way.*

P (with hearing disability): She's up ...top here translate because at the beginning is says translate interprets ..I'm going to wonder what's translate. This should probably say this machine will help you or this machine interprets. (*Passenger with hearing disability does not need translation.*)

4. Understanding how to carry out the tasks?

P.: Not being able to go back or sort of saying wait a minute, wait a minute, I haven't read yet. I have no control over the screen.

P.: Well no. You bring me to a machine, and you put me in front of the machine, are you going to take my picture? I'll just wait for you to set up your thing here, and until actually something happens on the screen I don't know what I'm supposed to do. And when it does happen, it would be nice if it would tell you something like "this machine will translate for you and tell me what you need."

5. Knowing what to do next?

A.: And for me I don't think so.

A.: *I think having something flash "continue" would help. You'd sort of realize that what you had done has happened and go onto the next thing. Prompting. See our computer prompts you. If you don't do something it says you haven't done so and so. It tells you what you haven't done. It guides you right along and we're used to that.*

P.: Well I would say yes because I have no control over the screen.

P.: Sometimes, yes. There were things I needed and they were not there. Like I wanted to sit forward at the wings; I wanted to make sure I saw the movie. Or like I had to pay \$25 and I didn't know why ... and there was no option for me to ask why. But what was done was actually very straight forward; there were times it was very clear. I was satisfied.

6. Understanding how the information on the screen relates to what you are doing?

A.: There I guess in as far as relates to what I'm doing it is presuming a certain sequence at check in. *I find it is a problem not having the ability to go back to one of those steps and offer the - in other words I guess the loop. Cannot have that loop.*

A.: Not from me because I'm used to working on the screen. It may be more difficult for somebody who is not used to looking at a screen. My side is pretty well all airport lingo; I'd be able to work my way around it. Also in terms of the way you would do it without a screen vs. how you do it with the system. Do they match? Is the order the same? Are there different problems you encounter? Is the process the same?

A.: Well this way you're going into great detail where you wouldn't without the machine. You do what you have to do with less explaining. I think this way you could go through your process doing everything absolutely 100% right; without the machine you wouldn't do that.

P.: And I would say also from a passenger's point of view despite the few little snags that we've talked about. As soon as I see that there's one line there that applies to me and as soon as I realize that by pressing on that screen I can communicate with that person, it makes me feel good. Even though I can't tell him everything; but we don't speak the same language so I'm not going to be able to have a great conversation with him anyway but that I can communicate my desires is great. Even if there are little details that I can't get across like I don't get to see the movie, at least I know I can get the seat I want and you know that I feel satisfied.

A.: This may not mean too much but just last week I had a passenger get off a Cathay Pacific flight and she had one of those little computers that she types in what she wants and it made it so much easier. Normally if she didn't have this machine and she was connecting on an Air Canada flight to Montreal it would mean going through a lot more like where's your ticket and her going through her purse. This way she walks off the plane, had this little computer and it says where does Air Canada 150 depart from? I read that, and she's gone in 10 seconds.

7. Finding the information you want?

P.: Problem. I think the information doesn't have enough in certain regards. Not enough options you mean? Yes.

P.: Well it's you know this machine makes me do what it wants to do; I just don't think it has enough information in it...if I run into a problem, how do I

communicate with the agent? Delays for example. Just a simple delay. If you're delayed two hours you need a meal voucher.

8. Difficulty reading information?

P.: No. Once I read it I could figure out what it wanted. There are a couple of words here and there which are kind of unnecessary, like terminology. You can always figure it out though. Anybody who knows any French can figure out what it wants. Yeah it was really good except for a couple of words.

P (with hearing disability):. Some deaf people can't pick up as much information. The average deaf person's literacy is maybe grade four level...

A.: No

9. Color of the screen?

A.: That's similar to what we have downstairs. Although the light lettering, that's light on dark. I find dark on light easier the eyes because your eye doesn't have to strain as much. The dark background you have something bright coming at you so your eyes will dilate based on the background which seems to tire the eye over a period of time. A number of agents use our screens because we have a screen we can switch back and forth. And a lot of them use it this way because this is the old way the CRTC's were made. That is the light on dark. I always use it the other way around, it's more relaxing.

P.: It was fine for me but then again I'm only using it for the one time. The one thing I don't know if we have found this *I did find the numbers confusing. The '8'. The first time looked at it, it looked like a zero.*

A.: *I don't know about the flat screen. It should be at a vertical angle, or straight up. This is like a keyboard; I can see your point but you go to bank machines and they are vertical; also, the light was shining in today.*

A.: *It's hard to see with the glare. The glare was so bad. Especially when you were tired like most passengers would be. As an agent, because we are used to working on the screen anyway it could be smaller for us, but a little larger for the passenger... and if the actual screen was on a rotating hinges you could adjust it for the glare.*

10. The rigidity, inflexibility of the system?

P.: It's a problem. *I think once again going back to the inability to loop and go back to a menu. And the fact that you have no access. I also have no way of going back to the main... Once your in the system that's it.*

P.: Yes, definitely .. as a passenger. *It left me - sort of panicking. Sometimes I had no option at all from this end.*

A.: Basically I'm the one controlling it. She has no say other than sending me an answer.

P.: Maybe have a repeat button or something...like I have changed my mind I would like to go over this again.

11. Lack of help feature?

P.: Yes. Because there didn't give me an answer but *it was a order. Well take it or leave it. Excuse me but you know!*

12. Losing track of where you are in the system or what you have done?

P.: No because I was under his command basically.

P.: If I change my mind? Well I always had the option of cancelling.

A.: Yes, but as a passenger you don't want to do that. Just think of someone who is coming from Hong Kong and has travelled by donkey to Hong Kong and has taken the plane over here and travelling by himself and *he gets in front of this machine ... it's very intimidating. It's amazing how intimidating just checking in already is for most people, even well travelled people. So they would never dare touch that key once they've sent their information.*

P.: When I got to the boarding pass I felt lost in the process, not because the instructions were wrong but because they were missing. My options were missing.

13. Having to remember too much information while carrying out the task?

A.: No I don't think so.

14. System response times (too fast)?

A.: Response time itself, no, it was alright. *I think the only problem is my sending a message before her reading the previous response, that's where it could be a problem, as I mentioned that light in some way sort of acknowledges she's finished. You need some feed back on that one.*

15. Duration of information on the screen?

P.: *Or perhaps something on the screen that says touch here after you've finished reading.*

P.: Yes. Especially for certain types of things. Like for example the first one. If you speak English - touch this one. If you speak French, speak Spanish well there's you just press and you get the next thing on the screen so there's no need for that one *but when your getting to the negotiations side... your trying to make the decisions, okay should I take the option of flying tomorrow or no I have to fly today, you know have to think about those things, so the passenger needs control of the screen.*

A.: ...similar to any computer training course where it says you know press enter to continue. And a change of face. Something for her to sort of release it back to me to say that okay I'm ready for the next message.

P.: But he has to wait to read my responses. I guess this situation comes up if you're reviewing your ticket the sign comes up and says please wait. It may well be that he transmits the next message before you've read that. What did that say? Although it's not important really.

P.: Well, of course when we're doing it in this environment it's pretty easy to tell what's going on but it did take a long time once I sent the message and then have it read ... it seemed like a long time. *I think it's especially long in Cantonese.*

16. System response times (too slow)?

A.: *Possibly too sensitive* and then it becomes cumbersome to try to go back and correct an error that might have slipped in because of sensitivity. *And I think perhaps sensitivity isn't quite correct it's the closeness of the choices at times.* Just being too close whereas if your too quick in a rush situation you might hit the wrong number or the wrong choice.

A.: I noticed especially when we were on that you pay or I pay the hotel. Because we had pressed.. we wanted to really press the lower one actually ...and the upper one came up.

P.: I did find it difficult with my screen. There were many times that I was pressing it and nothing was happening. It was finally with the dates you know the numbers were too close and it told me to move ... down so I was almost touching the other numbers. So that was you know...found that confusing. And I found confusing that whether I should press March and the date or just the number, you don't know.

17. Unexpected actions by the system?

A.: The only thing that was unexpected was when you brought up the actual flights and the send thing changed from the top to the bottom.

18. An input device which is difficult or awkward to use?

A.: It is too sensitive, you wave your hand over something and it reads it right away.

P.: You had to hit the button several times before it would take...should be more responsive.

19. Knowing where or how to input information?

A.: Just initially. Once again any passenger agents point of view after the first, second, third time is going to be something that lets us know what her response is to that. Did you have any problems.

P.: Yes. There was sometimes. In terms of pressing here or touching the screen.

P.: Well again a couple of times I tried to hit the square and it didn't work a couple of times.

A.: Well you know everything was fine with me except the design, the flat surface or touching ...I'm just not used to it.

20. Having to spend too much time inputting information?

A.: No. I don't think it was overly...*but it was missing a lot of options.*

21. Having to be careful in order to avoid errors?

A. : Yes.

P.: Yes. But I guess that's inevitable you know, that's nothing.
But as we were talking about the numbers that if we were to space them a little further apart maybe...

22. Figuring out how to correct errors?

P.: Yes. I'm not sure but is there any way of correcting a mistake? Short of cancelling... but this screen here does not have a cancel all the time.

P.: Because I would say that when you press your answer should be highlighted so that you can see which you have selected and then if I realize if I've made a mistake then I wouldn't press the continue or whatever I'm going to press. Or again *maybe a help function should be in there or somehow and interrupt key or something or oh I'd like to go back or something or I made a mistake.*

A.: *Could it be programmed that you'd have a key that would bring back the previous display. Would that be feasible? And that would help me doing corrections if you change your mind. And if I press that button and bring the previous display well it would automatically trigger him to come back to what he was doing. He may not know why right away but you know you look at your screen - oh I thought I was checking in what's this baggage screen doing there. But I guess he would know that by a beep or something. When you enter does it beep? So then we would know I had activated something. (Provided you could hear above all the noises.)*

23. Having to spend too much time correcting errors?

A.: *Yes. I think that's the main problem. In here if I wanted to change my mind with that aisle seat which happens all the time. They tell you window and they want aisle. Did come back to me and say your seat is ...?*

24. Having to carry out the same type of activities in different ways?

25. Any other comments?

APPENDIX D
LIST OF PURCHASED EQUIPMENT

LIST OF PURCHASED EQUIPMENT

1. 2 M320ST electroluminescent touchscreens, 25,4 cm (10") diagonal
2. 1 Ampro 186 computer with supporting peripherals
3. 2 3.5" disk drives and disks
4. 1 Hammond power supply and peripherals
5. 1 3.0" muffin fan
6. Miscellaneous hardware e.g. cables, switches, jacks etc.